

January

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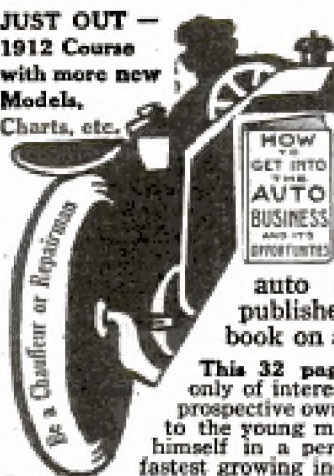
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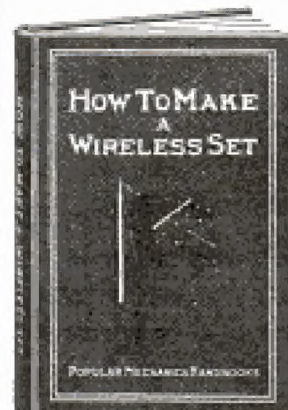
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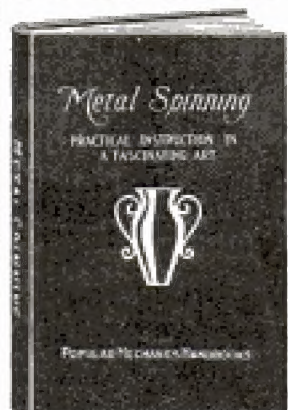
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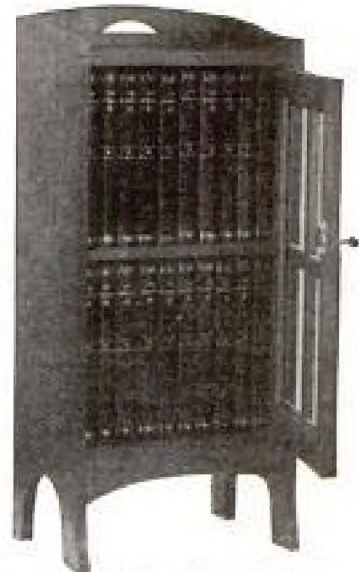
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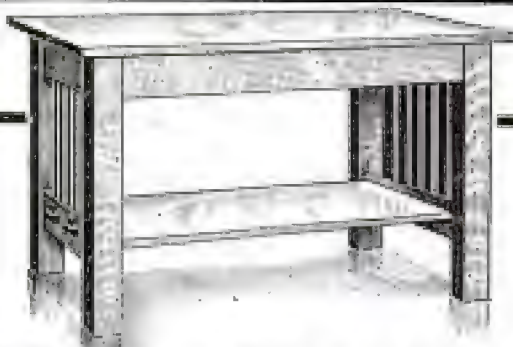
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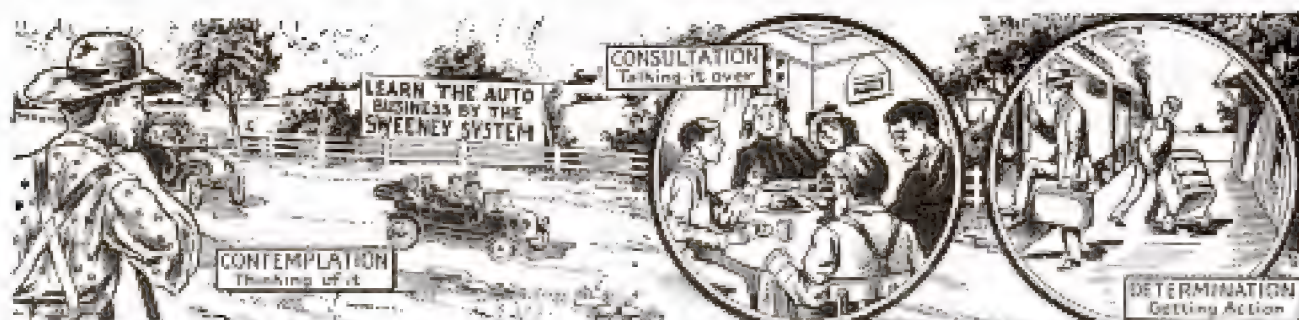
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September 25, 1911.

Popular Mechanics Magazine, Chicago, Illinois.

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10,000 RECEIPTS, POINTERS, PROCEDES, etc., for every business, 500 pages, price \$3. Circular and scientific book catalog for stamp. B. P. Newham, Waukegan, Ill.

\$1.50 PLACES your 50-word advertisement in over 100 magazines. Insertion proved. Particulars free. Zenith Agency, Station N, Cincinnati.

WRITE TODAY for plain talk on how to start mail order business. Tells how you can make \$50 a week. Herman, 3756 Spruce, Philadelphia, Pa.

BE A MANUFACTURER: Mixer Advertiser tells anyone how. Copy free. Lem & Co., Shattuck, Ohio.

POSITIVELY BEST HIBBONS, three, \$1.10. See what I say under "Trampers" at Aitchison.

FREE—SEND FOR MY CIRCULARS that will put you on the right road to success. Free. Frank Cote, Saco, Maine.

I MADE \$50,000 in five years with a small mail order business; began with \$5. Send for free booklet. Tells how. Heacock, Lockport, N. Y.

GATHERING INFORMATION in your locality pays big money. Either sex. Particulars free. National Information Bureau, Drawer 15, Sta. A, Columbus, Ohio.

START A MAIL ORDER BUSINESS in your own home. Everything furnished. Write for particulars. Popular Show Card Co., Desk O, 1215 Michigan Ave., Chicago.

FACTORY FOR SALE or rent, 50 x 150 feet; two stories; in fine village on two railroads. For particulars write P. D. Freeman, Knoxville, Pa.

HAVE YOU ANYTHING TO ADVERTISE? Our Rate Book tells you all about advertising mediums, rates, circulation, closing dates, etc. Sent for 10c. Worth dollars. Folder free. Correspondence limited. Dearborn Advertising Agency, 455 Franklin Bldg., Chicago.

BIG PROFITS: Open a drying and cleaning establishment. Very little capital needed. We teach by mail. Write for booklet, Ben-Vonde System, Dept. C, Charlotte, N. C.

YOU WILL INCREASE YOUR BUSINESS if I write Sales Letters for you! De Fabry, Marbridge Building, New York.

BUSINESS OR FACTORY WANTED. Am looking for an opening. Will pay cash, give full description and best price. P. Mechanics, Box 1308, Cherry Valley, Ill.

A FEW STATES AND CITIES OPEN for men of push and small capital. Operating gum vending machines. Tennessee Vending Co., Nashville, Tenn.

IF YOU ARE LOOKING FOR THE DOLLARS you owe it to yourself to send for our free Booklet. Bliss Bros., 50 Caspar St., Rochester, N. Y.

CONDUCT A "CANDY KITCHEN". Clear \$20 daily. Small capital required. Send for particulars. Kenson and Co., 148 West Ontario St., Dept. A, Chicago.

MAIL ORDER MEN: Get quick cash returns. We furnish best sellers; factory prices; best plans; positively no "scheme." Proprietors Free. Box M—235 Pittsburg, Kansas.

TREMENDOUS PROFITS, WITHOUT CAPITAL, wonderful repeating article, permanently increasing orders. Write immediately. Morris, 4 St. 137 East 27th, New York City.

MONEY MADE during Leisure Hours with my Dollar Getting Secret. Valuable Samples Free! G. Edward Harrison, Baltimore, Md.

SEE WHAT WE SAY under "Patent" heading. Buff. Agency, Washington.

ARE YOU OUT OF WORK or dissatisfied with your present occupation. Read my advertisement, Page 14.

PATENTABLE IDEAS WANTED—Send for 3 free books. Richard H. Owen, 30 Owen Bldg., Washington, D. C.

START A MAIL ORDER BUSINESS of your own. Be your own boss. I made \$25,000 in two years with small capital to start. My booklet "Money Making Opportunities in the Mail Order Business," sent free. Address, McKean, Dept. 375A, 232 Eighth Ave., New York.

FOR SALE—Iron and Wire Works. Doing an average monthly business of over \$2,000. Business well established. Address G. Schaller, 714 Palmyra Ave., Toledo, O.

SHORT CUTS, monthly describes the one way by which thousands are making their escape from the "breadmill" and "payday." Wage earners especially interested. Worth \$5 per copy. Third man, Schlemmer, those wishing easier money or honest side issue mailed instantly. Two months' trial, 10 cents., Burdick, Dept. 7, Oakdale, Mich.

ESTABLISHED GARAGE FOR SALE; largest in Yonkers; regularly storing 50 to 60 cars; two-story building with accommodations for over 100 cars; large repair shop with first class machine equipment. For particulars, address Garage, 217 Riverdale Avenue, Yonkers, New York.

LEARN THE TRUTH about Mail Order Business before buying "souffles." Important information and particulars sent free. Mail Order Library, P. M., Tompkinsville, New York.

HOUSTON, TEXAS, the railroad, cotton, lumber, rice and oil center of the South, offers unequalled advantages to manufacturers. Houston will encourage and support a Wagon Factory, Oil Machinery Factory, Tool Handle Factory, Furniture Factory, Coopers Plant, etc. Houston is the supply depot for the great Gulf Coast country. For better advantages, come to Houston. Write for specific information. Address, Chamber of Commerce, Houston, Texas.

I WILL START YOU earning \$1 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, showing plans of operation. G. F. Redmond, Dept. 305, Boston, Mass.

BUILD A BUSINESS of your own and escape salaried drudgery for life. Learn the Collection Business. Limitless field; little competition. Few opportunities so profitable. Send for "Pointers" today. American Collection Service, 101 State St., Detroit, Mich.

WE START YOU in a Permanent Business with us and furnish everything. We have new easy selling plans and reasonable leaders in the mail order line to keep factories busy. No canvassing. Small capital. Large profits. Spare time only required. Personal assistance. Write today for plans, positive proof and sworn statements. J. M. Pease Mfg. Company, 181 Fennel Bldg., Michigan St., Buffalo, N. Y.

PATENTS SECURED—C. L. Parker, ex-examiner Patent Office, 510 G St., Washington, D. C.

DOGS, POULTRY AND LIVESTOCK

POINTERS, SETTERS, HOUNDS, bulls, cats, larders, collies, grown dogs and pups, list free. Shirley Kennels, Shelbyville, Ky.

BLACK ORPINGTONS and Andalus chickens none better. Price reasonable. Ellis Foster, Caldwell, Ohio.

CANADIAN WILD geese for sale, good choice, guaranteed to call. Homer Woods, Hebron, Ill.

MALTESE HEN and Carneau; good stock; reasonable. Lafreire, Yonkers, N. J.

TOY WHITE SILK POODLES real Toys from 2 parent pairs, \$15. Toy Foxterriers, \$10; Pomeranians, English Bulls, 15c, every variety. American Kennel Co., 113 East 9th Street, New York City.

POULTRY JOURNAL—Practical and reliable; monthly; special introductory offer, 6 months for 10c. The Poultry Record, Box 31, Carey, Ohio.

PIGEONS—FEW CHOICE HOMERS, guaranteed mated pairs, one dollar. Kirkville, 102 E. Park Ave., Highland, N. J.

SCOTTISH COLLIE DOGS. Send for list. W. R. Watson, Oakland, Iowa.

FANCY SINGLE COMB Buff Orpingtons. Inquire. Darg Hutington, Lehigh, Kansas.

AGENTS WANTED

WANT A FINE TAILOR MADE SUIT? Show our samples to three of your friends, take two orders, easy and make profit enough to get a well tailoring suit free. No trouble, simply show our new up-to-date samples. Everybody surprised, prices so low, styles so beautiful, orders come easy. We take all the risk and guarantee perfect fit or no sale. We pay the express, \$5 a day our new agents are making and wearing the swiftest clothes besides; old agents after one season make twice as much. Hanner agents have a snap. We want a few more hustling agents, willing to dress well and make \$5.00 a day and up. No money or experience needed. Write quick before we fill your territory and we will send you free a complete outfit to start at once—beautiful samples, latest styles in colors, everything you need to take orders all fully explained. We will make you even one beautiful suit at a special inside wholesale price as a sample. It's a wonderful opportunity to write at once or tell some friend who would be happy to get this grand easy money-making chance. Hanner Tailoring Co., Dept. 219, Chicago, Illinois.

AGENTS: Will you excitement! Do you blame them? Everybody eager to buy our beautiful artistic air brush design show cards. Agents making \$75 per week. Cards printed in colors, size 11 x 11, 289 varieties. No talking—simply show the show cards to storekeepers—the cards speak for themselves. Big profits, something new. Tide just selling in. Can start mail order business. Beautiful two-color catalog furnished with your imprint. Exclusive territory given in your own county. Your success really success for us—all in cash. So you can see, without spectacles, that we are really in business for your welfare. Rest assured, we will start you making cash money as you never even dreamed of making. The show cards are great, you'll say so, you can't help it. Write right up, no time to argue. Do it now, send this very minute a letter or postal for free catalog and sample. Popular Show Card Co., Box 7, 1335 Michigan Ave., Chicago.

EARN \$15 TO \$25 A WEEK as our Mail Order Dealer. Right from your own home. Hold your present position until entire time is required. We are manufacturers and owners of Patented Just in season recent order specialties. If you are just starting a Mail Order business or if already established, you can't afford not to handle our Patented Money Making getters. We sell exclusively to our Mail Order dealers. We protect them. We carry stock and furnish everything. No canvassing. Small Capital. Experience unnecessary. Write today for Latest patented leader and Manufacturers' Easy Selling Mail Order Plan backed by "World Truth," positive proof and sworn statements. J. M. Pease Mfg. Co., 624 Pease Bldg., Michigan St., Buffalo, N. Y.

AN IDEAL GIFT, indispensable after using once. Do not miss this offer. I want Agents in every town to sell the Magnallum Home and Strop, the greatest invention in this line; everybody using a razor buys one; no barber shop should be without one. Saves time and labor. They sell from door-to-door for 10 Cents to Two Dollars; send for agents price list or One Dollar for a Two Dollar Home and Strop. They are wonderful and sell themselves. Charles Santing, San Francisco, told 125 in one week; his profit being \$25.00. You can do as well or more. Territory given. Answer now. The Magnallum Manufacturing Company, 314 Brown Street, Philadelphia, Penna.

AGENTS, GET BUSY SOMETHING NEW: Tremendous selling going on everywhere. Bets sold 600 the first week; Boushners sold 200 in two days. Other fellows making \$6, \$10, \$20 daily. Light, compact; can carry in pocket. Enormous demand; large profits; territory going fast; Act quick. Postal brings Free Booklet. Will show you how to make money quick. Universal Import Co., Dept. 3224, Cincinnati, O.

ASTONISHING INVENTION—Just patented. New Light-weight, easy running combination Handwood Floor Brush and Polisher. A child in few minutes operation can give floor a mirror-like finish. Women delighted, pleased, enthused. All say "Indispensable." \$18 daily guaranteed. Get territory. Write now E. W. Hazen & Co., Toledo, O.

AGENTS—\$5 to \$15 daily. New Invention. Wonderful Spring Winder Machine. Hand power. Simple and strong. Makes wire springs any size for any purpose. Factories, mills, machine shops, garages, etc., buy at sight. Irresistible. Men enthusiastic. Write at once. Nath. Mfg. & Sales Co., 355 Nath. Union Bldg., Toledo, O.

AMAZING INVENTION—Entirely new lamp burner. Changes common kerosene light into large, brilliant, white flame. Burns gas or electricity. Odorless. Smokeless. Not a mantle. Can't break. Wonderful, different. Irresistible selling proposition. Experience unnecessary. Show one; sale made. Sample outfit, \$30 prepaid. Will start you. Radiolin, 254 Calumet, Toledo, O.

WANTED RELIABLE PERSON IN EVERY CITY. Either sex to push the sale of new patent household articles; new ironing device; bestow door locks; umbrella clothes bars; combination skirt and trouser hanger; folding sleeve board; ideal toaster; sanitary water proof rug; etc. \$5 to \$15 daily; easily made. Now is the time to get started. For particulars address, Dexter Supply Co., 508 S. Dearborn, Chicago.

AGENTS BIG PROFITS. Brand's Patented Automatic Hazer Goggles, automatically puts a perfect haze on any rain, old eyes or safety. Retail at \$2. Big seller. Every man wants one. Write quickly for terms, prices and territory. P. Brand's Outfitter Co., 34 West Broadway, New York City.

AGENTS, PORTRAITS. 50c; Frames, 15c; Pillow Tops, 80c. Catalog and samples free. Write for particulars of how you can make \$25 a week selling these goods. Central Portrait Co., 2609 Wilcox Ave., Chicago, Ill.

AGENTS WANTED—Article sells at sight. Two to six in every home, 100 per cent profit. Barchell Distributing Co., Box 57, Lima, Ohio.

AGENTS WANTED—Men or women to sell our line of Household Specialties: \$25.00 weekly. Sample and Catalogue free. B. H. Deben Specialty Co., Dept. C, 3490 Tappan Ave., New York.

NEW SUIT OFFER: Just send us your name and you will promptly receive the most astonishing—yes, wonderful suit offer, together with Paragon Complete Outfit, packed with big assortment of Cloth Samples, Face Measures, Fashion Measures, Order Blanks, etc.—all absolutely Free by Return Mail. Postpaid. This includes an offer on a line suit for yourself so liberal it will startle you, and our Grand Offer to start you in a big money-making business for yourself. Our wide-open terms, conditions and privileges will astonish you. The low prices we will make you on men's high-class clothes will amaze you. And we pay all express charges. We go to the limit in liberality. We want you for our agent in your town, so that we can turn all our business over to you. We will start you in a big, established, money-making business. New agents make \$100 a week. Do you wonder that our agents make all kinds of money? We must have an agent in your town. Get our Grand Offer and the Special Paragon Outfit, which is already packed with big Assortment of Cloth Samples and complete equipment, ready to be sent you free, charges paid by us. "First Come, First Served." Rush your answer to us quick if you want a suit for yourself, before some one else gets the prize. Address Dept. 11, Paragon Tailoring Co., Chicago, Ill.

YOU CAN EARN \$25 per week and up without canvassing, by our plan. Indispensable household article. New plan. Pleasant work. Experience unnecessary. Particulars free. Sample 10c. Stomacher Sales Company, Lissner Bldg., Los Angeles.

10,000,000 U. S. HOMES NEED The Aladdin Mantle Lamp because they burn kerosene. Using less oil than ordinary lamps, the Aladdin outshines gas or electricity. Sells itself on overnight trial. Mail and \$50 on money-back guarantee. Not one returned. Sample lamp furnished. Write quick for agency proposition. Mantle Lamp Company, Dept. 118-31, Chicago.

AGENTS—Get particulars of one of the best paying propositions ever put on the market; something no one else sells; can make \$1,000 yearly. American Products Co., 5070 Spanglers St., Cincinnati, Ohio.

WANTED AGENTS, 25 cents profit each \$1.00 sale, best article ever offered, sample 10 cents. Woodward Co., Bowles St., Springfield, Mass.

AGENTS GET OUR FREE PROPOSITION on up-to-date Household necessities. Big money for you. Write at once. Landis F. Ezra, Waynesboro, Pa.

MANUFACTURER, ESTABLISHED TWN YEARS, wants Sales Manager to organize state selling force. Patented article universally used. See sold in stores, agents only. Handsome income assured. \$500 capital required. Sheer-Cut Shear Co., 234 Women's Temple, Chicago.

WE CAN USE A FEW MORE good live agents to sell our new double suction hand vacuum cleaner, built on humor and made to get results, the kind you get repeated orders on. Wizard Mfg. Co., Madison, Wis.

\$2 TO \$10 A DAY clear profit. Great money making proposition. Every household buys one on sight. 100% profit. Address Ryder & Co., Portland, Ore.

AGENTS—Write at once. We will positively show you how to make \$50 every week. Frank E. Carlin, Plomer, Ohio.

A GASLIGHT BURNER for kerosene lamps; perfectly safe. No mantle; no chimney. Samples to all who mean business. Luther Mfg. Co., Dept. 47, Cincinnati, O.

YOU CAN MAKE \$\$\$ as our general or local agent. Household necessity; sales 50 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Patton, Newark, N. Y.

SALESMEN TO SELL new automatic wrench to dentists. Good profits. Unworked territory. Write today for profitable offer. The Superior Wrench Co., Box 900, Marshalltown, Iowa.

AGENTS—Come to the best house in America for extracts, perfumes, toilet goods and many other items; big money in our line; don't sleep till you write us. Kingham Bros., Indianapolis, Ind.

WANTED—AGENT. Man or woman, in every town to sell "Egyptian Triple Service Neckwear, Five Ties, for \$1." The best advertised line of goods' neckwear in the United States sold direct to the consumer; goods sell on sight. Indianapolis Neckwear Co., Sales Bldg., Indianapolis, Ind.

AGENTS—We manufacture four of the most fascinating game boards ever invented. 100% profit; orders bound to repeat, nothing like them on market, slot machines beat. Particulars free. Unique Novelty Co., Independence, Iowa.

AGENTS GET MY FREE PROPOSITION on up-to-date Household necessities. Big money for you on easy work. Write at once. Landis F. Ezra, Waynesboro, Pa.

AGENTS—WOODWORKERS OR HANDY MEN why not start a business of your own easily offer—biggest seller out, every family a customer; the folding Climax Ironing stand, best ever invented; full instructions and patterns; only one dollar; make up and get busy. Send for circular. N. Schell, Chillsouth, Ohio.

SEND 25 CENTS FOR PACKAGE of finger-nail polish. Terms to agents. E. A. Thomas, 1113 Willard St., Ann Arbor, Mich.

MEN AND WOMEN EVERYWHERE Don't hesitate. Write: Agents simply coin money selling our Easy-Item-Skirt Gauge. Gen. R. Boardman Co., 228 Wyandotte St., Box 347, Kansas City, Mo.

AGENTS, AND MAIL ORDER SPECIALTIES that sell 150 to 500% profit. No change proposition. Success absolutely certain. Three samples for dime. Free particulars. Paulsen Manufacturing Company, 218 East Tenth Street, N. Y.

DON'T SLAVE for wages, be your own boss; earn \$5 to \$15 daily; we show you how. C. D. Brown Specialty Co., Reading, Pa.

WATER STRAINERS, costing 24c; sell 15c. Norplash Co., Superior, Wis.

GREAT SUE OFFER Just write us and we will send you absolutely Free, by return mail, postpaid, a large outfit containing a big variety of cloth samples, fashion figures, size measures, under blouses, etc. Everything Free, and we will start you in a paying business. A most liberal offer on a suit for yourself that will make you wonder. Terms, conditions and privileges that will astonish you. We will name you so much lower prices on men's fine clothing that it will surprise you. We want a live agent in your town. You can make \$1,000 to \$2,000 per year. If you will write us before we get an agent in your town you will get a wonderful offer. As soon as we get an agent in your town he will get profits on every dollar we sell in his territory. We turn all our business over to him. That's why our agents make so much money. If you want a suit for yourself answer quick before we get an agent in your town, you will then get all of our great inducements. Address Dept. 468, American Woolen Mills Co., Chicago, Ill.

WANTED—Live hustlers make \$10 to \$30 a day selling high grade automobile specialty. Write Yale Furthers, Orestburg, Wis.

\$25 WEEKLY and expenses to men and women to collect names, distribute samples and advertise. Steady work. C. H. Emery, M. S., Chicago, Ill.

OUT OF WORK? Sell our Specialties. All necessities. Steady income for steady work. You cannot afford to miss this. The E. W. Horton Co., Baltimore, Md.

AGENTS: Send for free booklet, inside information on the agency business. Filled with money making plans. Printers and experience of thousands of successful agents. Address J. M. Finch, 1182 3rd St., Dayton, Ohio.

\$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffer, Texas, Mx., Chicago.

MAIL ORDER ADS THAT PAY. 20 different propositions fully explained. All bona fide, sure-fire money-getters. Each one the foundation of a successful Mail Order business. Send 10c for full particulars and regular bulletin of new propositions. Mail Dealers Wholesale House, 459 Franklin Bldg., Chicago, Ill.

WANTED—Agents to sell teas and coffees. Burns & Reed, 509 Hudson St., New York.

AGENTS WANTED—To introduce new Keyless lock guaranteed burglar proof. Fast Seller. Tinker, Holcombe, Wis.

"PREVENTO"—Every eyeless wearer interested. Big profits. Samuels, Optician, Wilkes-Barre, Pa.

EXPERIENCE UNNECESSARY. Agents wanted to introduce our household necessity. Sells in every home. Big profits. Particulars free. The Montgomery Company, Devils Lake, North Dakota.

MAIL ORDER MEN: Handle best sellers. Factory prices. Send for free prospectus. Mississippi Valley Co., Pittsburg, Kans.

MAKE \$5,000.00 PER YEAR! New Agents proposition, write White Vending Company, 1335 Van Buren St., Chicago.

AGENTS SELL Household Specialties, make 100% profit. Co-operative Sales Co., Box 1009, El Paso, Tex.

AGENTS WANTED—Send 25c silver for one of our Spark Gas and Gas stove lighters, and one of each of our catalogues with terms to Agents. A. K. Mankin & Co., Alexandria, Va.

AGENTS—Have great sellers, Reducts living cost. Annual revenues. Union Sales Co., Box B 67, Danville, Ill.

SEE WHAT WE SAY under "Patent" heading. Swift, Attorney, Washington.

SMALLEST ALARM CLOCK, Bells, Trunkcases, Pocket Knife and Lord's Prayer Charm, 15c each, postpaid. W. H. Garner, 4118 South Lafayette St., Evansville, Ind.

TREMENDOUS PROFITS WITHOUT CAPITAL. Automobile accessory, permanently increasing orders. Morris, 5 Men. 137 East 27th Street, New York.

ARE YOU OUT OF WORK or dissatisfied with your present occupation. Read my advertisement, Page 14.

LOCKS ANY DOOR INSTANTLY, carry on her ring, weight 1/4 oz., 15 c. Agents wanted, I. N. L. Co., 310 Rockwell, Jackson, Mich.

BE YOUR OWN BOSS—Make \$1-\$5 daily. No capital required. Send for sample, particulars. A. Homan, 928 Tullahoma Bldg., New York.

BIG MONEY IN SELLING USED AUTOMOBILES—No business so easy to learn, so profitable, so congenial. On \$50 to \$200 investment our Agents make \$50 to \$150 per week. We furnish the cars and teach you how to drive, sell and repair them. Write to-day for particulars and territory. The Automobile and Cycle Company of America, Dept. One, 1749-1787 Broadway, New York City.

SIGN PAINTING AGENTS. 100% profit. Best and cheapest Window Letter made. Easiest mounted. Quicks free. Success positively guaranteed. Embossed Letter Co., 2563 Milwaukee Ave., Chicago.

AGENTS WANTED—SELL HIGH LOOKING Imported 36365 rug, \$1 each. R. H. Carter, Milan, Tenn., sold 115 in four days; his profits, \$31. You can do as well. Write for sample offer and unique selling plan; exclusive territory. A. Condon, Rug Importer, Stonington, Maine.

AGENTS—To sell the newest electric appliance on the market; sold everywhere there is electricity, in the home and office; liberal profit; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use the light instead of the gas and get the same results; sells for \$3.50 and saves the purchaser an investment of \$25; write for particulars. The Handy Light Co., 211 Marsh Avenue, East Cincinnati, Ohio.

LINE HERE, AND YOU GUARANTEED HOSIERY direct from mill to wearer. All styles and qualities. Splendid opportunity for live agents. Customers waiting. Re-orders insure permanent increasing income. Exclusive territory credit. N. Parker Mills, 720 Chestnut St., Philadelphia, Pa.

AGENTS MAKE 500% profit selling our gold window letters, novelty signs and changeable signs. 500 varieties in enormous demand. Catalogue free. Sullivan Co., 1233 Van Buren St., Chicago, Ill.

WE WANT YOU to act as our representative for your community. Experience not necessary. No capital required. No traveling. All or part time. Write for full particulars (enclosing stamp for reply). National Printing Company, Waukegan, Oklahoma.

BIG WINNER FOR AGENTS: 7-in-1 Nickel Plated Steel Combination Tool Key Ring; screw driver, can top opener, bottle cap opener, cigar cutter, pipe cleaner, nail cleaner; most useful pocket novelty invented; sells itself. Sample, postpaid, 10c, Joseph Mathien, 201 Court St., Brockton, Mass.

AGENTS—Get six pairs guaranteed loose trees. Write for unparalleled special offer. Big money selling Triplewear Hosiery. Beautiful line, guaranteed six months. First application secure agents. Triplewear Mills, Dept. D, 110 Grand Avenue, Philadelphia.

PORTRAIT AGENTS find our plan beats all others. Prompt shipments—selects credited. 30 days' credit. Catalogue of Portraits, Frames, Pillow Tops, Sheet Pictures and samples free. James C. Bailey & Co., Desk 74, Chicago.

MEN AND WOMEN WANTED to control exclusive agencies, rapid selling, low priced specialty. Universal demand, plenty repeat orders; good profit to hustlers. Write for free sample and terms to-day. The G. V. Sales Co., Room 1325, 130 Nassau St., New York City.

LIVE AGENTS WANTED—HUSTLERS to handle our attractive 1912 combination packages of soap and toilet articles with valuable premiums. One Michigan agent made \$65 in 47 hrs.; another \$24 in 8 hrs.; another \$22.50 in 14 hrs. Write today. Davis Soap Works, 264 Davis Bldg., 1429 Carroll Ave., Chicago.

AGENTS—SIGN PAINTERS. Cost 10c, sell 35c. Something new. Guaranteed Window Letters mounted with benzine and roller. Grip Outfit Free. Embossed Co., 2612 Milwaukee Ave., Chicago.

ORIGINATORS AND MANUFACTURERS of 4 piece combination pure aluminum crocker valued \$5.00, sells \$1.50. Agents make \$10.00 dollar; get our prices quick. Independent Mfg. Co., La Grange, Ill.

WE PAY \$80 A MONTH SALARY and furnish rig and all expenses to introduce our guaranteed stock and poultry cordless money back guarantee outfit free; new plans; steady work. Address Bigler Co., N 208, Springfield, Illinois.

AGENTS—GET OUR ORIGINAL fast selling food specialty formula now. Guaranteed biggest money getter out. Make and wholesale in stores. Start with \$5. Materials everywhere. 84c profit every \$1 sale. Complete formula, details, sample, etc., postpaid, 25c. Brown's Bakery Supply, 314 So. Figueroa St., Los Angeles, Cal.

AGENTS—MEN AND WOMEN MAKE \$5 to \$15 Daily. 50 to 500 sales in nearly every office building! Nearly every user of a desk telephone will pay a quarter, without argument, for an Empire Cord Holder. Send 12c today for sample. Empire Supply Co., Chicago.

BAIN \$39 WEEKLY taking orders for Cut Rate Groceries, for America's largest grocery house. Quicks Free. Standard Grocery Co., 332 Arcade, Cleveland, Ohio.

ONE MILLION AGENTS WANTED; fast seller costing 5c, selling 50c. Every firm needs. Orders to \$50. Postal brings samples. Embossed Co., 2197 Milwaukee Ave., Chicago.

LARGER PROFITS—MAKE YOUR OWN GOODS. We furnish formulae, manufacturing processes and trade secrets. All free. Fourteen years experience. Instructive circulars Free. B. Myrtle Company, Washington, D. C.

ENVELOPE MOISTENER, NO-WHITE PENCIL Self-selling. Sample, terms, 10c coin. Apex Sales Company, 1221-1228 17th St., Denver, Colo.

LIVE AGENTS—We have the greatest little article for home, office, hotel, ever produced; enormous demand. Dime brings four samples. Be quick. Bedouin Novelty Co., 318 East 55th St., New York.

AGENTS: TRY OUR LINE. Any goods you place on approval, which are selected, we replace free of charge. Domestic Supply Co., Butler, Pa.

WANTED—AGENTS, 7 cents profit each 30 cent sale; best little article ever offered; sample for 3 cents in stamps. Barlings, Box 945, St. Louis, Mo.

400% PROFIT SELLING GORDON Pillow Tops. High grade work. Samples and catalogue free. Luther Gordon Co., 144 Washington St., Chicago.

SELF-THREADING NEEDLES, 10c a paper. Agents' samples and terms free. Ladies' Art Co., Dept. 41, St. Louis, Mo.

AGENTS—Embossed Gold and Silver Sign Letters. Immensely profitable. Sample free. Johnston Co., Guilford, Ill.

AGENTS—BEST 25c seller on the market; over 100% profit; field unlimited; 10 a day easy. Silver Co., 202 N. Michigan Ave., Chicago.

AGENTS—PORTRAITS 35c, FRAMES 15c. Sheet Pictures 1c. Stereoscopes 25c. Views 1c. 30 days' credit. Samples and catalogue free. Consolidated Portrait Co., Dept. 1191, 1027 W. Adams St., Chicago.

GYROHEEL, the new patented heel of rubber, will make "Shoes and Easy Money" for you. Send 25c for sample pair and wholesale prices. Eagle Rubber Company, 213 East Tenth Street, New York.

AGENTS, BIG PROFITS selling Babler's Safety Ice Creams, send the best size of your shoes and 25 cents for sample and terms. A. E. Babler, 124 Cherry St., Waterbury, Conn.

SUBSCRIPTION AGENTS WANTED. Capable men make from \$1.00 to \$6.00 a day. The Scientific Digest, Kansas City, Mo.

SALESMEN FOR OUR NEW Penny Gum Packages (tag or postcard with each package for 1c). 340 packages cost salesmen \$1. Austin Mfg. Co., Cranston, R. I.

DON'T WASTE TIME with dead ones. Here is the best seller of all. Sells itself. 100 per cent profit. Ray Co., Hancock, Ia.

AGENTS—FIRST CLASS legitimate proposition. Three to five dollars daily. Arthur Clarke, Hammond St., Chicago.

AGENTS—Make \$3.00 to \$5.00 profit daily handling our new, up-to-date Nameplates, Signs and Numbers. Brett Bros., Boston, Mass.

KEY CHECK AND FOR OUTFITS, for stamping names on checks, fobs, etc. Prices free. Pease, Die Maker, Winchester, N. H.

AGENTS WANTED—To sell Brass Hand, Force, Section and Spreading Pumps. Write W. W. Brown, Randolph, Vt.

SALESMEN WANTED for specialty. Enclose stamp for particulars. H. D. McDonald, 189 No. Dearborn, Chicago.

EXCLUSIVE TERRITORY NOW BEING ALLOTTED for Little Giant Lift and Force Pump. Only thing of its kind. It has free field wherever there's plumbing. Removes all stoppages in pipes, saves plumbers' bills, prevents noxious gases. Everyone wants it, everyone can afford it, everyone can operate it. As strong in business world as among homes. Selling at top speed. 50,000 already in use. I can grant you absolute monopoly and do you for life. If you are the right man. Address at once, J. E. Kennedy, Dept. P, 41 Park Row, New York City.

AGENTS—It will cost me about \$2 to secure your name and ship sample machine, but it's a dead sure way of convincing you I've got best household invention on earth. Branch offices being established. Opportunity for commission and crew managers to make up to \$20 a day. Elmer E. Stevens, 1180 Curless St., Des Moines, Groto, Ill.

THE NEW "SWIFTLY" GAS LAMPS light instantly with a match like city gas; no alcohol used; radically different from any other; portable or systems. 100 to 1,000 candle power at will; burners cheap for old lamps; Agents making money; great novelty; wholesale price for introduction. Planet Mfg. Co., Dept. 4, St. Louis. (Established 1868.)

AGENTS TO SELL GUARANTEED GROCERIES at Wholesale direct to Consumers. Big pay, steady work. We sell Best Goods on earth. Safe customers 25%. W. W. H., Hitchcock-Bell Co., Chicago.

BIG PROFITS—Exclusive territory, not in stores. The Magic Cooker—collects all other household specialties. Belden Supply Co., 17 E. Lake St., Chicago.

RAINCOATS—To order from MHI to Weaver; write for particulars and samples. Agents wanted. Seagull Raincoat Co., Gaither Building, Baltimore, Md.

WANTED: Salesmen on our New Census Publications, splendid opportunity. Men making \$40 to \$45 per week. Rand McNally & Co., Dept. D., Chicago, Ill.

JOKER ARTICLES, TRICKS AND PUZZLES. Illustrated Catalogs. Prices and 2 samples, 10c. New Idea Novelty Co., Desk A, 28 Warren St., New York.

AGENTS—DON'T accept an agency until you read our new book, "Filing Dollars," its Free. Darling Bros., Derry, N. H.

AGENTS—\$50 weekly; we manufacture the best needle case made; a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" envelopes do the work; general agents can make over \$100 weekly; sent 30c. for a 25c sample containing 115 needles; particulars free; try direct from the factory at wholesale. Patz Needle Co., 102 Union St., Somerville, Mass.

AGENTS WANTED to sell our beautiful scripture wall posters. Frank Shilling Co., Navarre, Ohio.

AGENTS MAKE \$30.00 WEEKLY selling our 500 Handy Household Articles; catalogue free. Scheff Company, 1637 Wells Street, Chicago.

\$DOLLAR ADDER—Pocket Adding Machine. Wonderful seller. Guaranteed, \$1 postpaid. Globe Sales Co., 2171 Leavenworth, Omaha, Neb.

I WILL START YOU earning \$4 daily at home in spare time, delivering mirrors; no capital; send for free instructive booklet, giving plans of operations. G. F. Redmond, Dept. 305, Boston, Mass.

AGENTS—HANDKERCHIEFS, DRESS GOODS. Carleton made \$4.40 one afternoon; Mrs. Bosworth \$25.00 in two days. Free samples. Credit. Stamp brings particulars. Freeport Mfg. Company, 59 Main St., Brooklyn, N. Y.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass doors. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 466 N. Clark St., Chicago.

GENERAL AND LOCAL AGENTS: Here is your opportunity. Energetic men can make \$2,500 yearly and up. The Improved Concheater Kerosene Manilla Lamp revolutionizes oil methods. Far superior to electricity, gas, kerosene or gasoline at 1/10 the cost. Burner fits all lamps. Safe; clean; odorless. Burns with or without mantle. Tested and pronounced by State of Pennsylvania "Most efficient light found." Greatest seller known. We want a few more like men in open territory. Concheater Light Company, Dept. P, 3E, 294 N. State St., Chicago.

LIVE AGENTS WANTED. A permanent income selling Knoch Combination Kit, 15 tools in one. Finest tool steel, guaranteed. Big profits. Wonderful seller. Exclusive territory. Send for free sample offer and terms. Currier-Knoch Mfg. Co., 52 West St., Connersport, Pa.

AGENTS OUTFIT FREE. Quick profits. Best Handkerchiefs, Dress Goods and Fancy Goods on the market. Large Manufacturer. Particulars for stamp. Maritopa Mfg. Co., 93 Walter St., Brooklyn, N. Y.

HONEST MAN OR WOMAN WANTED in every town to represent well-known wholesale firm. Experience unnecessary. Must furnish good references. Easy, pleasant work. Fair salary to start. McLean, Black & Co., 251 Medford St., Boston, Mass.

MEPPALIONS SELL AT SIGHT. 500 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Reag Co., 1295 W. Randolph St., Chicago.

AGENTS—WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. S. H. Farish & Co., 202 S. Clark St., Chicago.

WIDOWS, Ladies, Men. New Interesting, Profitable, easy work. Spare time or permanent. Sell our useful specialties. Our original selling plan will double your sales. Particulars and \$2.00 premium offer free. Fair Mfg. Co., RPSI, Racine, Wis.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one, lightning seller. Sample free. Thomas Mfg. Company, 403 Third St., Dayton, Ohio.

PERFECTION POCKET ADDING MACHINE. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R., Cincinnati, Ohio.

HELP WANTED

ARE YOU THE MAN? Here is your opportunity. No matter where you live—if you want to make big money and establish yourself in an independent business requiring no capital—we will teach you, by mail, all the secrets of the Real Estate Business including thorough commercial law course, list with you readily salable properties, co-operate with and assist you to permanent success. Our 64-page free book fully explains our methods and tells what it means to be the local representative of oldest and largest Co-Operative Realty and Brokerage Corporation in the world. Write today to International Realty Corporation, 2134 Manhattan Building, Chicago, Ill.

EARN \$10 TO \$15 A WEEK and hold your position besides. No experience. We, as manufacturers of patented just in season specialties, have now easy mail order plans to keep our factories busy. We furnish everything. Large profits. Small capital. Experience unnecessary. If you are one of the want-to-go ahead kind, write for our most modern plan. Sworn Statement, J. M. Pease Mfg. Co., 525 Pease Bldg., Michigan St., Buffalo, N. Y.

WANTED—One good man in each town to take orders for men's tailoring; beautiful styles; very low prices; orders come easy; high class; permanent business; line profits; \$10 a day and up; no money or experience needed. We ship on approval express prepaid, and guarantee perfect fit. Write for free sample outfit and inside price on suit for yourself. Banner Tailoring Co., Dept. 320, Chicago.

WANTED RELIABLE MEN to learn Automobile Driving and Repairing in the largest and best equipped school teaching this trade. A most interesting, beautiful and paying profession. Can be learned in a few weeks and at small cost. Competent men always in demand at salaries ranging from \$18 to \$35 a week. Our 32-page book "How to Drive" gives full particulars. Great College of Motoring, 1457 Wabash Avenue, Chicago, Ill.

A HIGH CLASS INVESTMENT. Salesman wanted in every City and Town East of the Mississippi River. Exclusive territory. Contract will be entered into with men who can show credentials as to character, ability, record, etc. (Investment, Insurance and Real Estate men preferred.) A big opportunity for really Business-Gentlemen to represent a large Eastern Corporation offering the public a safe, profitable and attractive investment, backed by the endorsements of men of National reputation and standing. Address Manager, 606 Metropolitan Bank Bldg., Washington, D. C.

GOVERNMENT CUSTOMS, INTERNAL REVENUE, Railway Mail Examinations everywhere soon. Get prepared by former United States Civil Service Examiner. Write now for free booklet. Patterson, Civil Service School, Box 828, Rochester, N. Y.

YOU ARE WANTED FOR GOVERNMENT POSITIONS. \$80.00 month to commence. Annual vacations. Short hours. No "lay-offs." Common education sufficient. Over 12,000 appointments coming. Influence unnecessary. Send postal immediately for free list of positions open with description. Franklin Institute, Dept. R21, Rochester, N. Y.

REPRESENTATIVE WANTED for Morrow Electric Suction Cleaner in each city. Price, \$35—guaranteed five years. State fully your experience and standing. Liberal discount and contract to right parties. The Morrow Co., 201 Adams Express Bldg., Chicago.

WANTED—RAILWAY MAIL CLERKS—Average, \$1,100. Every second week off—full pay. Examinations announced everywhere Jan. 15th. Write for free sample questions. Candidates prepared free. Franklin Institute, Dept. R21, Rochester, N. Y.

ROBBER ROOM SPECIALTY. Leading manufacturer wants an exceptionally high grade salesman, capable of selling \$100 specially to large power plants. Minimum com. on each sale, \$25. Ladd, 845 Niagara St., Buffalo, N. Y.

ARE YOU OUT OF WORK or dissatisfied with your present occupation. Read my advertisement, Page 14.

SALESMAN AND BRANCH MANAGERS EVERYWHERE to handle best selling proposition known. Experience unnecessary. Legitimate, permanent and commands instant attention. Big commissions. Exceptional opportunity. W. E. Bryan & Co., Cincinnati, Ohio.

WANTED—INEXPERIENCED MEN TO WORK on actual contract jobs for small pay; electricity, plumbing, bricklaying, automobiles. Must first finish short correspondence course, but there is no expense. Catalogue free. United Trade School Contracting Co., Los Angeles.

WANTED—YOUNG MEN to learn automobile business: big pay; demand greater than supply; make you expert in ten weeks; automobile model free; interesting booklet free. Box 297, American Automobile Institute, Rochester, N. Y.

EARN \$20 WEEKLY taking orders for Cut Rate Groceries, for America's largest grocery house. Duffin Bros. Standard Grocery Co., 322 Arcade, Cleveland, Ohio.

MEN AND BOYS TO LEARN AUTOMOBILE repairing, driving on up-to-date cars; electrical, civil engineering, surveying, in most practical way. Rooms and board while learning. Positions secured; satisfaction guaranteed; catalog free. National School of Engineering, 2119 West 7th, Los Angeles.

I WILL START YOU in the cleaning and dyeing business in your own town. Big profits. Pleasant work. No capital required. Free particulars. John H. Boylke, Jr., Baltimore, 313.

BOYS—BOYS—EARN big money by distributing circulars in your town. Stamp fulgins apply. Northern Advertising Co., Chicago, N. Y.

SEVERAL AMBITIOUS MEN WANTED to learn Practical Drafting. For particulars write Draftsman, 394 Lewis Building, Pittsburgh, Pa.

WE TRAIN DETECTIVES. You can be one. Splendid opportunities. Travel. Earn \$100 to \$200 monthly. This fascinating profession taught practically and scientifically by mail at a terminal case. American School of Criminology, Dept. F, Detroit, Mich.

SUSPENDERS DONE AWAY with—Read "Ad" at Kokomo Suspender Box under heading "For Men." Agents wanted in every factory and office.

WANTED DISTRIBUTORS of advertising matter everywhere. Oliver D. Barker, Mount Pleasant, Pennsylvania.

ELECTRICAL MECHANICS WANTED IN EVERY STATE—\$200-\$1,500 yearly. Rapid introduction of Electricity creating new problems daily. We will fit you for splendid positions and assist you to get it. Booklet giving full particulars free. Write for it today. Fort Wayne Correspondence School, Dept. 20, Fort Wayne, Ind.

ALCA \$1.00 HAND VACUUM CLEANER wins best prize at all exhibitions. It is the best agent's proposition in the land. Write for money-doubling contract. Alca Vacuum Cleaner Co., Dept. A, 348 W. 60th St., N. Y.

WANTED, AGENTS, MACHINISTS, ATTENTION! Increase salary, new revised Saunders' Hand Book of Practical Mechanics, best ever ready reference. Thousands in use. Postpaid \$1.00 cloth; \$1.25, \$1.50 leather flap. Big profits. E. H. Saunders, 216 Purchase St., Boston, Mass.

WANTED ONE THOUSAND CHAUFFEURS and repair men. Our demand for automobile engineers exceeds the supply. Calls for men of intelligence and mechanical bent capable of commanding \$100.00 to \$150.00 per month upon graduation. Headmaster course \$25.00 to \$50.00. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. Auto Schools of America, Dept. T, 1400 Michigan Ave., Chicago.

WANTED SALESMEN to sell Gasoline Lighting Systems; no experience necessary; attractive proposition. Doud Lighting Co., 114 No. Sangamon St., Chicago, Ill.

STOP HERE! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No traveling. I furnish everything and guarantee success. Send for proofs. Veechies, Desk C. R., Omaha, Neb.

I WILL START YOU earning \$4 daily at home in spare time, without money; no capital; send for free instructive booklet, giving plans of operation. G. E. Redmond, Dept. 295, Boston, Mass.

WANTED—A man or woman to act as our information reporter. All or spare time. No experience necessary. \$20 to \$50 per month. Nothing to sell. Send stamp for particulars. Sales Association, 801 Association Bldg., Indianapolis, Ind.

RAILWAY MAIL CLERKS WANTED—Average salary, \$1,100. Write immediately. Franklin Institute, Dept. R 21, Rochester, N. Y.

GOVERNMENT CLERKS, \$20 weekly; free booklet of 24 desirable positions. Clerk Agency, Providence, R. I.

WANTED—RAILWAY MAIL CLERKS, \$20.00 month. Examinations announced everywhere. Jan. 1922. Sample questions free. Franklin Institute, Dept. R21, Rochester, N. Y.

\$5 PER 100 UPWARD paid tacking signs. Distributing booklets, samples, etc. No traveling. Secure police list paid and territory. Shogbates Agency, Dept. 112, Lebanon, N. H.

WANTED—RAILWAY MAIL CLERKS—Average \$1,100. Every second week off—full pay. Examinations announced everywhere. Jan. 1922. Write for free sample questions. Franklin Institute, Dept. R21, Rochester, N. Y.

MAKE MONEY writing short stories. Big pay. Free booklet tells how. United Press Syndicate, San Francisco.

5,000 GOVERNMENT JOBS OPEN—Write for list. Franklin Institute, Dept. R21, Rochester, N. Y.

WANTED PICTURE PLAY WRITERS. Big pay. We'll teach you how. United Picture Play Association, San Francisco.

BIG MONEY WRITING SONGS. Thousands of dollars for anyone who can write successful words or music. Past experience unnecessary. Send us your song poems, with or without music, or write for free particulars. Assurance guaranteed if available. Washington only place to secure copyright. H. Kirkus Douglas Co., Dept. 283, Washington, D. C.

GOVERNMENT WANTS EMPLOYERS—10,000 appointments coming. Excellent salaries. Vacations. Write for list of positions open. Franklin Institute, Dept. R21, Rochester, N. Y.

MACHINERY, TOOLS AND SUPPLIES

REBUILT MOTORS—We have a number of second-hand marine engines of our own and other makes, completely rebuilt and guaranteed by us. As the builders of "Buffalo" are not in the second-hand engine business, we will sell them at less than factory cost to make room. This is a rare opportunity to get the highest grade of engines—2 to 100-hp.—cheap. Buffalo Gasoline Motor Co., 1284-56 Niagara St., Buffalo, N. Y.

HANDY TOOL CABINETS for Toolmakers, Draftsmen, or Machinists, beautifully finished in Oak or Mahogany, concealed lock on drawers; ask for circulars and prices. The Ohio-National Manufacturing Co., Chatham, O.

1-HP. WATER-COOLED gas-engine—All cast iron parts—crank shaft and valves machined (blue prints and layout boxes included), \$20. Brantley Mfg. Co., Evansville, Wis.

FOR SALE: 20 light dynamo, \$50; 3-HP. steam engine with governor, \$50; 20 light dynamo with 3-HP. gasoline engine, \$75. A. H. App. Jr., Moline, Ill.

LIGHT METAL MANUFACTURING BUSINESS, largely used by government. Price, \$2,000—or less than two seasons net profits. Roberts Machine Company, East Palestine, Ohio.

TWO CYCLE TWO CYLINDER, 4" x 3½" Marine and Automobile, Gasoline Engines. Circulars and drawings of same for sale. Richards Iron Works, Manitowish, Wis.

BARGAIN: Williams Pipe and Bolt Cutting and Threading Machine used 12 days. Cuts and threads half to three inch. G. H. Rees, Lawton, Oklahoma.

LATHING FOR SALE—For lathings in small lathes write South Bend Machine Tool Co., Dept. L, South Bend, Ind.

FOR SALE—Machine shop and Foundry, doing good business must be sold at once; share other business. Medford Paly. Co., Medford, Wis.

OXY ACETYLENE WELDING MACHINE. Extra large; deal check for \$100 cash. L. M. Bowman, Jr., Tulsa, Okla.

OTTO GAS ENGINES! Standard of the World! Otto Gas Engine Works, 218 Granite Bldg., St. Louis.

INCREASE YOUR POWER, grind your Valves with Lightning Valve Grinder. Four grades in each can. Price \$25, prepaid. Lightning Mfg. Co., Cornish Flat, N. H.

WHEEL AND PINION cutting machine; \$35 cutters for model work. E. K., 354 Springfield Ave., E. Orange, N. J.

FOR SALE—One 3-HP. steam engine, practically new, \$25. A. H. App. Jr., Moline, Ill.

FREE—"How to Run and Install Gasoline Engines." Greatest little book ever published on this subject, sent free with year's subscription to Gas Energy. Learn how to solve all knotty Gas Engine problems in few moments. O. J. Scriven, Ind., writes, Gas Energy is best magazine published. Send \$2c for year's subscription. Book free. Gas Energy, 28 Murray St., New York.

WE BUY AND SELL Iron, Woodworking, Timbers Machinery. Muller, 215 Clinton St., Chicago.

FOR SALE—Two 10-HP. Gasoline Engines and two 18 x 7 ft. belt arrow cutting lathes. Two 24" Band Saws. Geo. J. Adams, 39 South St., New York.

2½ H. P. HAMILTON CORLISS engine, fine condition. The Sals Co., Canton, O.

SHEPARD THREAD CUTTING LATHE, ratings 10 x 36 inches. Good as new. Price, \$50. O. C. Horn & Co., Northwood, Ia.

FOR SALE—8 H. P. 2 cycle gasoline engine, new, \$175; 3 H. P. 4 cycle gasoline engine, new, \$75. A. H. App. Jr., Moline, Ill.

20 H. P. WHITE STEAM ENGINE, good condition. Bargain at \$25, or make offer. B. F. Rudin, Dalton, Mass.

FAIRBANKS MORSE 45 Horse gasoline engine. Also many others. Hugh Dyar, Marquette Bldg., Chicago, Illinois.

ARE YOU GUY OF WORK or dissatisfied with your present occupation. Read my advertisement, Page 14.

RUFFING AND GRINDING MOTORS, variable speed at the right prices. High efficiency motors and generators, ½ to 5-hp. for any purpose. We build any special motor or dynamo to order. Life and model work a specialty. United Electric Motor Works, Mesquite, Wis.

FOR SALE—23 in. lathe, \$100; others \$50 to \$400; Mallets \$125 up; drills, radial, boring mills. New machinery—joiners, combination woodworker, felloe-rounders, band and power saws. Some used wood working. Birchard Co., Janesville, Wis.

2½-HP. 4-CYCLE, WATER COOLED, marine or stationary, complete. \$25. W. C. Holden, No. 1 Main St., Ossining, N. Y.

MODEL STEAM TURBINE—All parts (in enough necessary to make a model Steam Turbine, and blue-print of same for \$1. Address Midget Machine Co., P. O. Box 214, Elizabeth, N. J.

FOR SALE, COMPLETE SET OF CASTINGS for ¾-hp. gasoline stationary engine, also one and 2-cylinder marine engine sets. Comet Motor Works, 564 Jackson Blvd., Chicago.

DYNAMOS AND MOTORS, any voltage or current, alternating and direct current are lamps, reliable and fully guaranteed. Get our Monthly Bargain Sheet. Cash paid for Electric Equipment. Machinery Sales Co., 11 East Woodbridge St., Detroit, Mich.

FOR SALE—Cement Gauge Wood Turning Lathe, Number 124, 28-inch, with collars. New. Cost \$115. Price \$130. Write for particulars. H. A. Towner, Little Falls, N. Y.

STREET FIVE CARRIAGE of 15 in. lathe and Sweetland 30 in., 400 phase chuck with 20 blocks, never used, want milline attachment or plain miller. Harry Kerslake, Box 187, Falls, Ky.

FOR SALE—New modern marine engines 2 to 12-hp.; latest design stationary for dynamos. Complete electric lighting plants. Hicknell Mfg. & Supply Co., Janesville, Wis.

IF YOU WANT the best information on cement and concrete construction, subscribe for Concrete, leading cement and concrete monthly. Sample copy, 10 cents. Yearly subscription, \$1.00. Concrete, 135 Newberry Bldg., Detroit, Mich.

CAM CUTTING—Bore 30 in. diameter, down to smallest. All varieties. Special prices on large quantities. Cam Cutting Machines in stock. Headquarters for Cam Cutting. The Garstin Machine Co., 137 Varick Street, New York City.

MAKE YOUR TOOLS. New process 20c. Stigner, Benton Harbor, Mich.

15 NEW Goshen Marine Engines. Cheap. Jack Intig, Goshen, Ind.

FOR SALE—3-hp. stationary or Marine Engine Cheap. Joseph Huch, Maple Valley, Wash.

PULLEYS, GEARS, SPROCKETS, Shafting Hangers; see page 138. W. A. Jones Foundry & Machine Co., Chicago.

THE PATTERSON TOOL & SUPPLY CO., Dayton, Ohio, are specialists in furnishing equipment for automobile repair shops. Tell them your wants.

FOR SALE—Rebuilt; Throttling, Automatic and Corliss Engines, Boilers, Pumps, Motors, Machine Tools, Tanks, Saw Mills, and general machinery, at bargain prices. Let us know your wants. The Handle Machinery Co., 1781 Powers St., Cincinnati, Ohio.

VERTICAL STEAM ENGINES, 2 to 25 hp. Send for circular. E. T. Frank & Son, 842 W. Pratt St., Baltimore, Md.

ENGINE CASTINGS, 1½ horse vertical gasoline, air-cooled, 47. Three horse marine water-cooled, \$9 cash; drawings included; catalogue for stamp. Novelty Manufacturing Co., 352 West Sixth St., Cincinnati, Ohio.

FOR SALE—Gasoline Engines, automobiles, marine and stationary, also castings. Second hand ones taken in exchange and for sale. Apply with stamps. R. W. Richardson, R. No. 36, Peoria, Ill.

FOR SALE—Engine lathe, swings 9½ in., takes 35 in. between centers. Complete with full set change gears to cut all size threads, 3 to 48 in.; price only \$43.50. Address L. F. Grammes & Sons, Allentown, Pa.

PATTERN-MAKERS! A book devoted to the principles of pattern and core making and molding. Written by C. H. Willard, a practical pattern maker of years experience. This book, just published, treats the subject in a much more simple, direct and effective manner than most books along this line. 224 pages, 312 illustrations. Price \$1.00 postpaid. Popular Mechanics Book Dept., Chicago.

SERIES OF 7 LITHOGRAPHIC MODELS—Steamship, Automobile, Gas Engine, Steam Engine, Steam Turbine, Wireless Telegraph and Dynamo. Size 8x14 inches. All parts of these machines are shown and numbered to correspond to printed keys of names. Price each 50 cents postpaid or set of 7, \$3.00 postpaid. Popular Mechanics Book Dept., 318 W. Washington St., Chicago.

FLOUR AND FEED MILLING MACHINERY

SPECIAL BARGAINS IN SECOND HAND: Auction Mills, Burr Mills, Crushers, Corn Shellers, Bran Dusters, Dust Collectors, Purifiers, Reels, Double, Single 2 and 3-pair High Roller Mills, Stone Rollers, Receding Separators, Scurers, etc. Write for description and prices. Sprout, Waldron & Co., P. O. Box 429, Muncy, Pa.

BLACKSMITHS

GOOD BLACKSMITHS ARE SCARCE and few learning the trade and the blacksmiths must make the tools for all—from saws to the safe hammer. Buy Toy's Modern Methods Forging and Welding different kinds of steel solid, and doing all hard jobs easy, also hardening and tempering to a standard by colored charts. Any smith can be an expert that means good jobs and big money. All for one dollar. Send for valuable samples free. W. M. Toy, Sidney, Ohio.

CEMENT

IF YOU WANT the best information on cement and concrete construction, subscribe for Concrete, leading cement and concrete monthly. Sample copy, 10 cents. Yearly subscription, \$1.00. Concrete, 135 Newberry Bldg., Detroit, Mich.

MANUFACTURING MACHINERY

SPECIALTY WORK in sheet metal for inventors and manufacturers—Die Work—Galvanizing. Submit your specifications—Same quantities. Prompt and accurate service. Kentucky Stamping Co., Dept. 87, Louisville, Ky.

PUNCHES, DIES, TOOLS, MODELS and experimental work. Inventions perfected. Light manufacturing solicited. Kirman Die and Tool Works, 1809 Market, Denver, Colo.

WE MAKE MODELS of any description, also tools, dies and press work. Manufacturers of patent articles. Send for free catalogue of Model Supplies. The Pierce Model Works, 2405 Pierce Ave., Chicago, Ill.

CLEVELAND SPECIALTY & MANUFACTURING CO., Cleveland, Ohio. Manufacturers of water motors, fans, tapping machines, magnet winders. Inventions developed. Special articles to order.

IRON, BRASS AND ALUMINUM CASTINGS. Metal Specialties. Patterns, Models, Polishing, Plating and Japanning. North Chicago Tool Works, North Chicago, Ill.

INVENTORS—WE BUILD MODELS, do experimental work, light manufacturing, dies and tools. Geo. Schwarz & Co., 123 Liberty St., New York.

MECHANICAL ENGINEERS

EXPERT DRAFTING SERVICE, by an experienced Engineer and Draftsman. Drawings for every purpose promptly executed. Ideas developed. Machines designed. Inventions perfected. Fred. D. Stillman, Springfield, Illinois.

INVENTIONS, DRAWINGS, TRACINGS, and blue prints made to order. Lowest prices. J. F. Greenwood, Mosera, N. Y.

I WORK OUT IDEAS, make drawings, patents, machinery designs. Irvin D. Treck, Monmouth Building, Chicago.

WE SPECIALIZE ON MECHANICAL ENGINEERING work for those concerns whose size do not justify the steady employment of a first class engineer. Machine design, structural work, mill construction, heating and ventilation, cost reduction, and commercializing inventions. The Engineering Bureau, P. O. 152, Springfield, Mass.

MACHINE DESIGN AND WORKSHOP DRAWINGS made, patents improved, etc., by practical mechanical draftsman. R. A. Cameron, Box 75, Berwyn, Illinois.

WANTED

A STRONG, OLD ESTABLISHED, manufacturing company, with a national selling organization, wants to add a new line of building material or construction specialty to manufacture and sell. Address L. F., 6th floor, 318 W. Washington St., Chicago.

WANTED—Propositions, Prices, Samples, Advertising rates, etc. Jasper N. Beard, Verna, Miss.

WANTED—20 H. P. Auto engine. Guy Enochson, Austin, Minn.

A COURSE IN MEMORY TRAINING, also book, "How to Speak in Public." Must be cheap. F. Berriek, Colm, Neb.

WANTED TYPEWRITER. See Typewriters, Front.

FOR SALE

SIGNAL FIRE ALARM BOXES for Street Service, japanned red, dust proof case with spring lock, complete with the most perfect and best made mechanism, just like new. Size 15 x 12 x 8 inches. Regular \$15.00 apparatus sold cheap to right user. Cosmos Electric Co., 134 Liberty Street, New York.

SLOT MACHINES CHEAP, all kinds; send for list. Electric Planos, \$70; Portables, \$4.50; Pin Gum Machines, \$2.50; \$25s wanted. James McCusker Amusement Co., 210-12 N. 8th St., Phila., Pa.

1911 PRATT MOTORCYCLE complete, with Herz magneto, costing new \$325; sell for \$145. One Edison phonograph with fifty records, will sell for \$25. Jacob Wetzel, Jr., R. R. 3, Box 43, Eureka, Ill.

\$2,310.00 RUBER CYLINDER Printing Press, \$300. Easy payments. Hurley, 117 N. Fifth st, Chicago.

TYPEWRITERS EVERY MAKE: 28 up; time; rent applies. Also motor cycles; phonographs. Knights, 214 12th, St. Louis, Mo.

WILL SELL TWO AMERICAN Box Rail Bowling Albers, 36 ft. long, cost \$300. Will sell both for \$100. Grover Horton, 4333 Warner Road, Cleveland, Ohio.

SIGNAL FIRE ALARM BOXES, for street service, japanned red, dust-proof case with spring lock, complete with most perfect and best made mechanism, just like new. Size 15x12x8 inches. Regular \$15.00 apparatus sold cheap to right user. Electric Motor Bargains. State size and type and we shall quote attractively. Job lot, about 1-25 hp. either current. Perfect condition, \$3.00. Cosmos Electric Company, 134 Liberty Street, N. Y.

MOVING PICTURE MACHINE OFFERT—For Sale Cheap. Write quick. Machine is complete and was used but a week.—L. Worden, 52 Cease St., Oakbrook, Wis.

FOR SALE—40 U. S. Springfield Rifle complete with bayonets, \$2.50 each F. O. R. Palmview, Wilbert Peterson, Plainview, Texas.

"TEXTIGUM" TYPEWRITER COVERS, 50c. See what I say under "Typewriters." Atchison.

TO WHOLESALE and trade in general. We are introducing new patented articles on the market. Send for list of same and also for catalogue of Typewriters, Motorcycles, Bicycles, Musical Instruments, etc. Atlantic Supply Co. Long Branch, N. J.

RENEW DRY CELL BATTERIES: No fake. Cost 1c each. Two guaranteed formulas, 15c each or both, 25c. L. M. Rachel Co., Dept. B7, Whitewater, Wis.

FOR SALE—Moving picture film, 1c foot; machines, \$40. H. Davis, Watertown, Wis.

SALE OR EXCHANGE

WANTED SECOND-HAND AUTOMOBILE in exchange for U. S. Patent No. 928358 Detachable Belt slide and Garment Supporter or \$400 cash. Write Arthur C. Davis, Box 353, Mulberry, Fla.

4 CYLINDER OPPOSED AUTO ENGINE. Oxygen Acetylene welding outfit to sell or exchange, for shaper, milling machine, air compressor, motorcycle. C. W. Hollingsworth, Reinbeck, Ia.

FOR SALE—Stromberg Carburetor, Rambler Radiator new, will trade for Cylinder record Phonograph. John Weisler, Gibson, Iowa.

WHAT YER GOT TO SWAP? For What. Thomas R. Pullis, 321 Chestnut St., St. Louis, Mo.

FOR SALE OR EXCHANGE—Complete Moving Picture Machine Outfit. Never been used. What do you offer or what have you for trade? Diamond or automobile preferred. L. Worden, 52 Cease St., Oakbrook, Wis.

SALE OR EXCHANGE—Fine Austrian Manlicher Rifle for typewriter. Harry Höl, 4381 St. Ferdinand, St. Louis, Mo.

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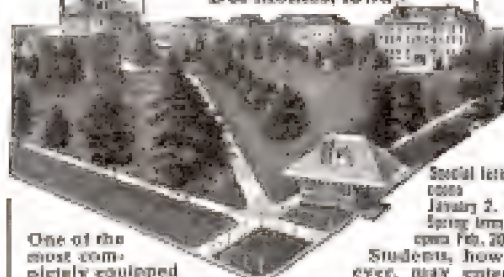


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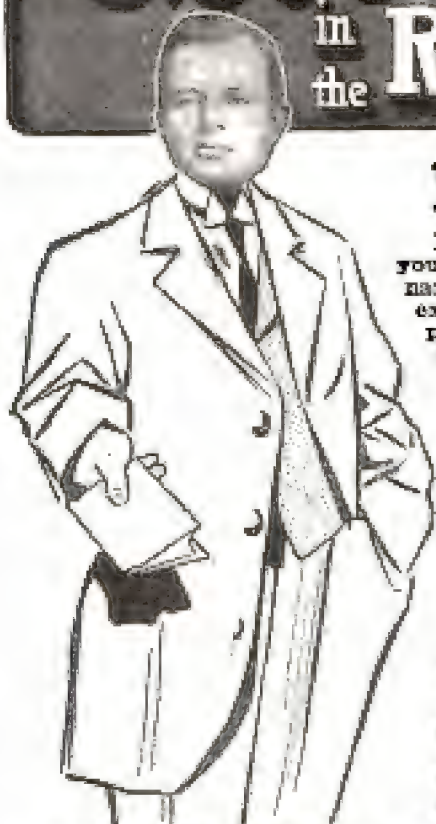
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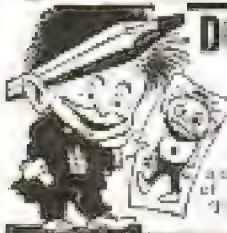
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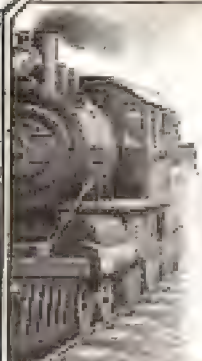
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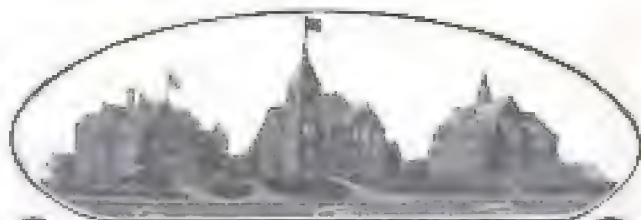
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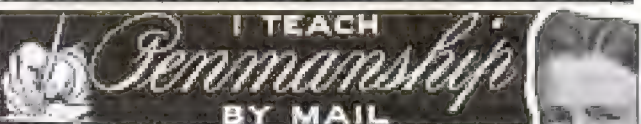
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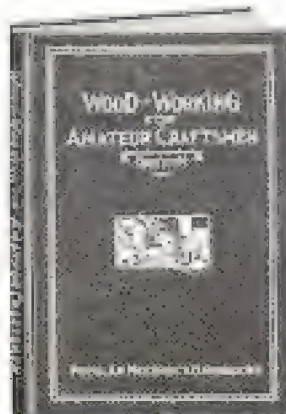
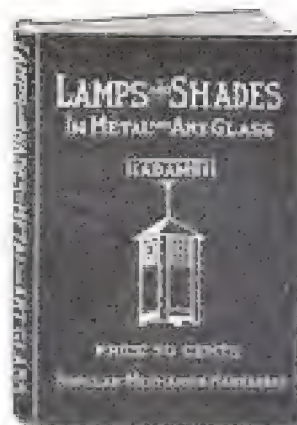
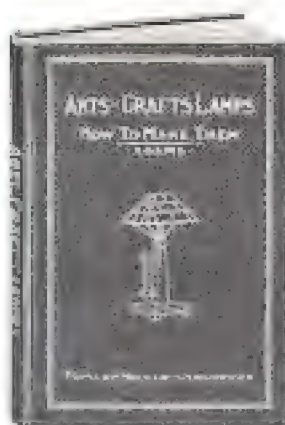
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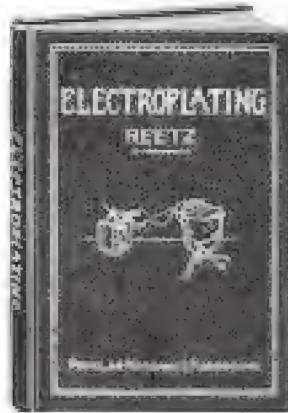
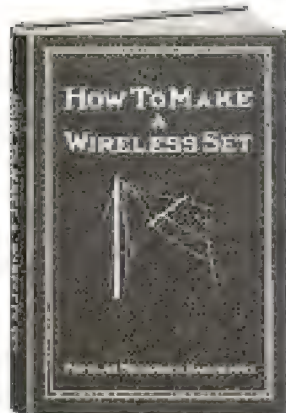
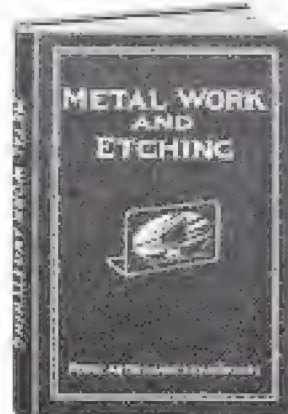
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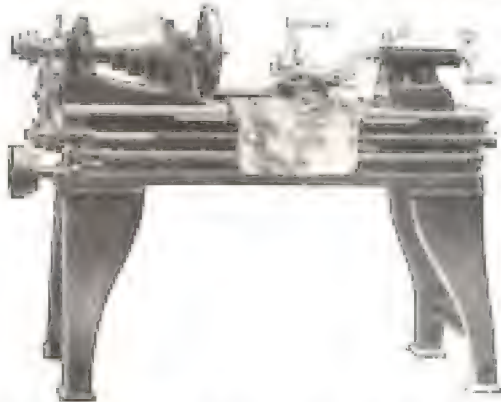


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CHICAGO, U. S. A.

Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

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No. 1

Motorcycling Through a Field Fire



Two Photographers Motorcycling through the Flame and Smoke of a Field Fire

WHILE two photographers of a British motorcycle magazine were journeying in their sidecar from London to Harrogate, they met with a rather exciting fire adventure and went through it without scorching. At one point beyond a curve the field to the windward of them was ablaze, and, running at high speed, they were into trouble before they realized it. Putting his hand over the vent hole in the gasoline tank, the driver of the machine opened the throttle and dashed through, steering as straight a course as the necessary ducking of his head

would allow. The greatest danger was the possibility of the gasoline catching fire, as the tank had just been filled and the explosive fluid had been spurting out of the filler cap, some of it even having splashed on the top of the tank. When they emerged from the zone of fire, a railway crossing loomed up with the gates closed, but application of the brakes brought the machine to a stop just in time. The front fire burst, however, due probably to the intense heat of the flame it had just passed through, though the clothes of the men were not singed.

"WATER KISS" SANITARY DRINKING FOUNTAIN

A sanitary drinking fountain in the form of an upturned sculptured face, from the lips of which the water bub-



The "Kiss of Life" Which has Replaced the Old "Cup of Death."

bles as from a bubbling cup, is the idea of a young Chicago sculptor. The head rises from a carved-stone or marble chalice, and from the lips each thirsty passer-by may obtain what the young sculptor describes as a "water kiss."

The model can be reproduced in plaster, cut in stone or cast in metal, to suit local requirements.

OZONIZED AIR FOR LONDON SUBWAYS

Ozonized air is to be introduced in one of the underground railways of London, where, particularly during rush hours, the air is very offensive and consequently injurious. The proposed plan is to filter the air at each station and then pass a portion of it over ozonizers. Then the two will be mixed and part of it be forced into the tunnel.

MEMORIAL TOWER AT THE GOLDEN GATE

A symbolic tower, 850 ft. high, is planned as one of the features of the Panama-Pacific Exposition in San Francisco. The plans call for a granite, anchored base, 220 ft. square; a shaft, 85 ft. square with corners rounded, of steel construction with marble or terra-cotta veneering, rising 625 ft. above the base, and surmounted by a large glass and steel globe, 85 ft. in diameter. At night the globe will be illuminated.

The approximate cost of the structure will be one million dollars. The tower is designed to serve as an observation point during the exposition, and subsequently may be of advantage to the government as a lighthouse and signaling station, weather observatory and wireless station. It will be located on the side of a knoll overlooking the Pacific Ocean and the Golden Gate, and the top will have an altitude of 1,100 ft. above sea level.

The undertaking is a private enterprise, and engineers have pronounced the plans to be entirely feasible and safe. It is planned to charge an admission fee until such time as the tower has paid its original cost and a fair return on the investment. Four passenger elevators will run from the base to the top of the structure for the accommodation of visitors.

The exterior of the base will be adorned by large memorial statues; and in the interior will be a memorial hall, 200 ft. square and about 80 ft. high. The four main groups of statuary adorning the structure at the top of the base will represent St. Francis of Assisi, after whom San Francisco was named, over the entrance at the front; overlooking the ocean, a commanding figure of Balboa discovering the Pacific; fronting toward the land side, a group of Father Junipero Serra landing at Monterey, and overlooking the Presidio, Gen. John C. Fremont, the soldier and pathfinder. The statues will be 80 ft. high.

A cafe as large as the memorial hall



St. Francis Tower, the 650-Ft. Lighthouse, Weather Bureau, Wireless Station and Observation Building, Which San Francisco Plans as a Permanent Memorial of the Opening of the Panama Canal

and an art gallery will be features of the upper floor of the base. The tower, to be known as the St. Francis Memorial Tower, will welcome ships to the Golden Gate. Its general import will be like that of the Statue of Liberty in New York harbor.



The Running Bob with a Load

A WHEELED BOBSLED

In Klosters, Switzerland, a place celebrated for the winter sports which attract thousands of people every year, a new kind of summer sport has been introduced, the well-known bobsleigh being substituted by a running bob, a three-wheeled vehicle. The wheels are covered with rubber tires. The wagon is steered by means of a lever, and the brake is worked by the feet.

¶Congress has been asked to direct the Secretary of War to turn over all tools, dredges, steam shovels, etc., used on the Panama Canal to the reclamation service as soon as the Canal Commission has finished using them.

¶A large portion of the raw material for French briar-root pipes, so highly prized by smokers, comes from the island of Corsica.

SATURN'S RINGS MAY BE ELECTRICAL

A new theory regarding the nature of the rings about the planet Saturn is advanced by Professor Birkeland, the Norwegian scientist. The generally accepted idea is that the rings consist of an immense mass of small particles encircling the planet, but Professor Birkeland now believes these rings to be an electrical phenomenon produced by the radiation of luminous matter from the planet, and that the rings, because of the continuous radiation, are being continually renewed.

In experiments made by him during a lecture at Christiana, according to the Electrical Review, he demonstrated that Saturn's rings may be imitated on a small scale. He also thinks there is good reason to believe that such a "radiating ring" will show effects of light and shadow like those observed, and that, through the hypothesis of radiation, it will be possible to find satisfactory explanation of all the peculiarities of the rings.

LONDON NOW ON SPEAKING TERMS WITH BERLIN

Public telephone service between England, Holland and Germany will shortly be opened, if the plans of the British postal authorities are realized. The service will be conducted through a submarine cable which has just been laid and turned over to the government by the contractors. The English end of the cable is anchored in St. Margaret's Bay, near Dover, and the continental end is at La Panne, Belgium. After a series of experimental tests, arrangements were made to open the wire to the public.

The laying of this cable, undertaken in connection with the submarine telephone cable between France and England, places London within "speaking distance" of all of the large cities in northern Europe. In fact, through the long-distance connections out of Paris, Antwerp, and Berlin, it is now possible for the business man in the English capital to talk to practically all of the European trade centers. It is understood that telephonic connection can be obtained by relays as far east as Vienna and as far south as Marseilles.

A TIMEKEEPING GLOBE

A Seattle inventor has patented an ingenious clockwork globe which tells at a glance the time of day at the city in which it is kept, and the hour and minute at any other part of the earth. The globe is split in two at the equator, and over a metal equator which is stationary move two metal ribbons, one marked with the hours and one with the minutes. A metal indicator marks the city where the globe is located, and points to the present hour and minute. By glancing along this equator and tracing down the meridian of any other spot on the earth's surface the hour and minute at that point can be learned.



PLAYING CHESS OVER A LION

Of all the unusual conditions under which chess games have been played, the one shown in the accompanying illustration might be considered the most startling, were it not probable that the match the men are playing is more mechanical than scientific in the moves made. Not only is the game



A Remarkable Setting for a Game of Chess

being played in the cage, but the board itself is between the paws of the lazily outstretched beast.

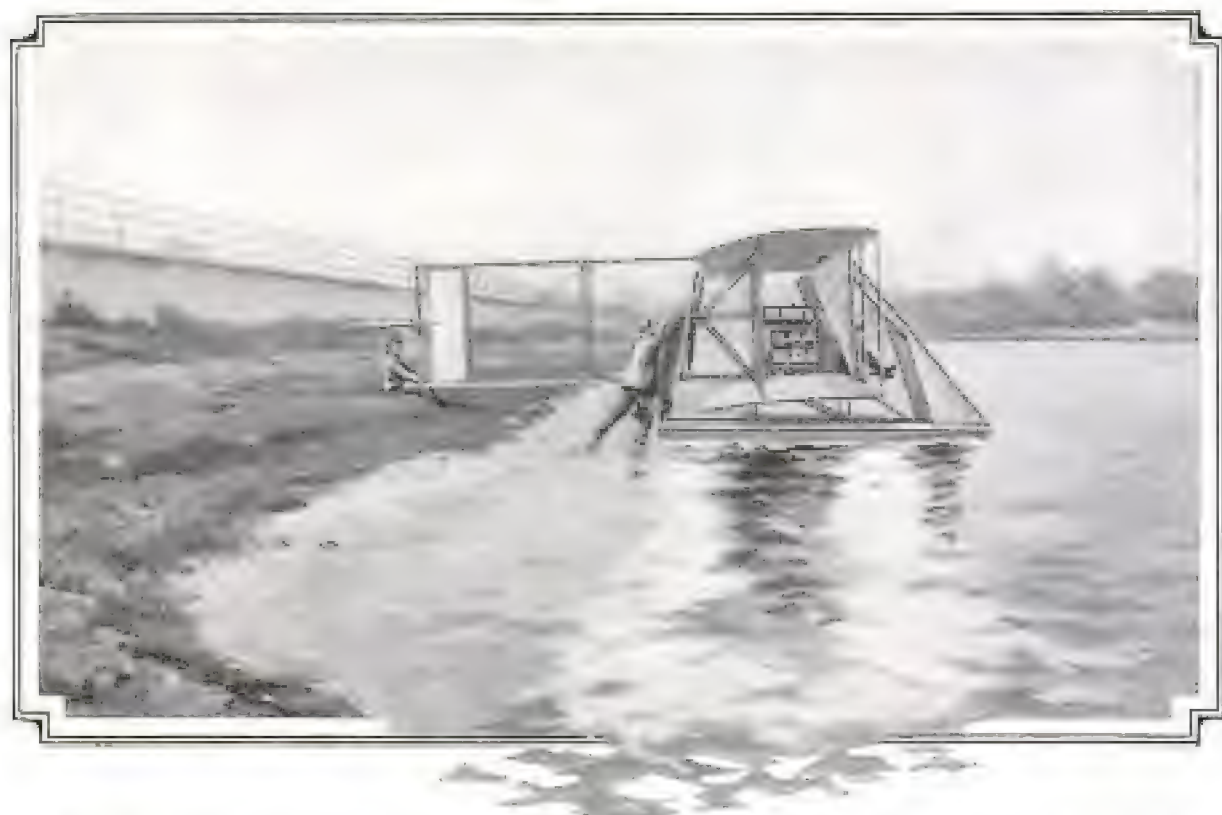
ARMY TESTS NEW RANGE-FINDER

A new range-finder has been given a series of severe tests by the officers of the United States army and may be adopted for use in this country. It has many distinctions from the range-finder now in use, its inventor setting up the claim that it has no delicate parts to get out of order as the most important feature. The range-finder consists of two telescopes of 12 powers, each incorporated in a common tube, something over 2 in. in diameter, leather covered and closed at both ends, with eyepieces at the center of the tube.

The arrangement is such that the combined telescopes may be simultaneously directed on the same target, the range-finder forming the base of



Method of Using New Range-Finder



The Wright-Type Hydro-Aeroplane Being Launched into the Water from the Beach at Marblehead

the triangle, having at its vertex the object, the range of which is determined by measuring the parallax. To make an observation, the observer grasps the handles and directs the instrument toward the object whose distance is to be ascertained. In the right eyepiece are placed two mirrors separated by an extremely narrow horizontal line. Supposing the object to be a flagstaff, the picture presented to the observer will be that of a broken column the upper part of which has been moved to the left.

The next procedure is to bring these broken lines into plumb, which is accomplished by a large screw having a milled head so situated that it may be operated by the thumb and forefinger of the right hand while grasping the handle. When the screw is turned to the left, the two halves of the image are brought together. Then the correct distance may be read through the left eyepiece, where a series of figures in yards appear on the surface of a wide disk, the scale having moved according to the direction in which the operating-screw head was turned.

A WRIGHT-TYPE HYDRO-AEROPLANE

The first Wright-type machine to be constructed as a hydro-aeroplane, rising and alighting on the water, has been tried out with success in the harbor at Marblehead, Mass. The two hydroplanes attached to the aeroplane were especially designed by a well known racing-yacht builder. Each hydroplane or boat has two steps, the middle step being half way back from the bow. They are 14 ft. long and 2 ft. wide, narrowing towards the bottom, are 10 in. in depth, and have curved bottoms at the bow, which gives them greater strength and makes them safer in case of a steep dive into water. An ingenious device, consisting of two small tubes running from the step to the top of the floats, is expected to prevent a dragging vacuum being formed behind the steps, practically ventilating the space where a vacuum would form.

CA process for making lace from human hair has been perfected in Germany.

Motion Pictures of Insects in Flight

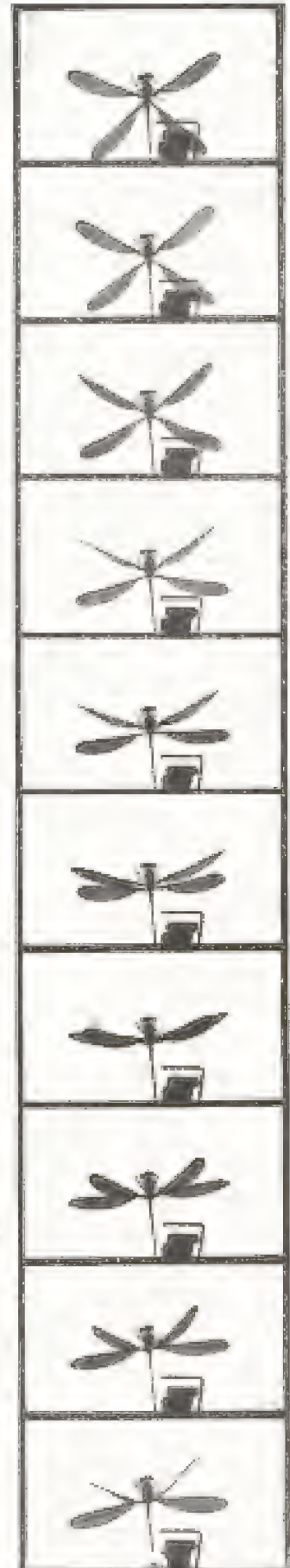
In making motion pictures of insects it is essential that the insect be given entire liberty of movement, so, in order to direct the flight in the field of the lens, the apparatus is placed near a window, the insects always flying toward the light. Another problem is the starting of the picture-taking mechanism at the exact instant the insect enters the field of view, and this, according to the kinds of insects being photographed, is solved in the following manner:

In the case of flies, the insect was held captive for a few seconds before the making of the pictures by means of an electromagnetic clamp, attached to one leg. This clamp was connected with the circuit of the shutter, so that it liberated the insect at the exact moment the first curtain of the shutter fell. In making pictures of bees, wasps, and other insects which hesitate before taking flight, the insect was confined for a very short time before freeing in a glass tube having its open end cut obliquely and directed toward the light. This opening was covered by a hinged shutter of mica, kept closed by a delicate spring, which also closed the electric circuit operating the camera shutter. The imprisoned insect, moving toward the light, pressed against and opened the mica door thus breaking the circuit. At this moment the operator closed a second break, and, when the insect had taken wing, the mica door fell shut, thus re-establishing the connection, opening the camera shutter and causing a series of pictures of the flight to be impressed on the moving film.

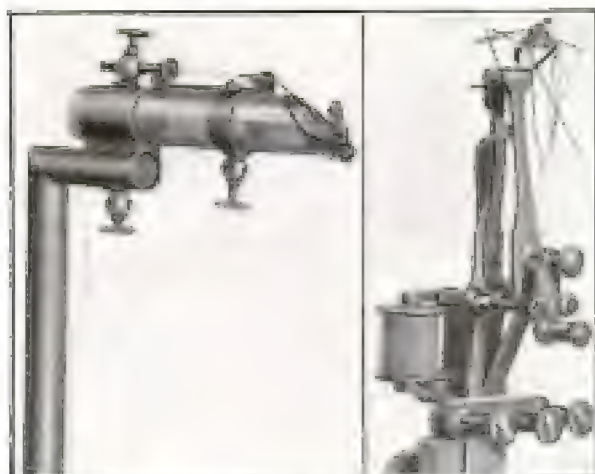
In making motion pictures of beetles, which hesitate still longer before taking flight, the above arrangement gave way to a little horizontal plate of aluminum, bal-



Pictures Showing the Flight of a Fly after Its Release from the Magnetic Clamp



The First Wing Movements of a Dragon Fly Commencing a Flight



A Bee Pushing Open the Mica Door, the Action of Which, through Electrical Connection, Starts the Picture-Taking Machine Operating When It Falls Back into Place; and Another Insect Held Captive by the Electric Clamp

anced by a counterpoise. The end of this plate projected slightly beyond the end of the glass tube, and when the insect, in crawling out of the tube, reached the end of the plate and flew away, the counterpoise descended and closed the circuit.

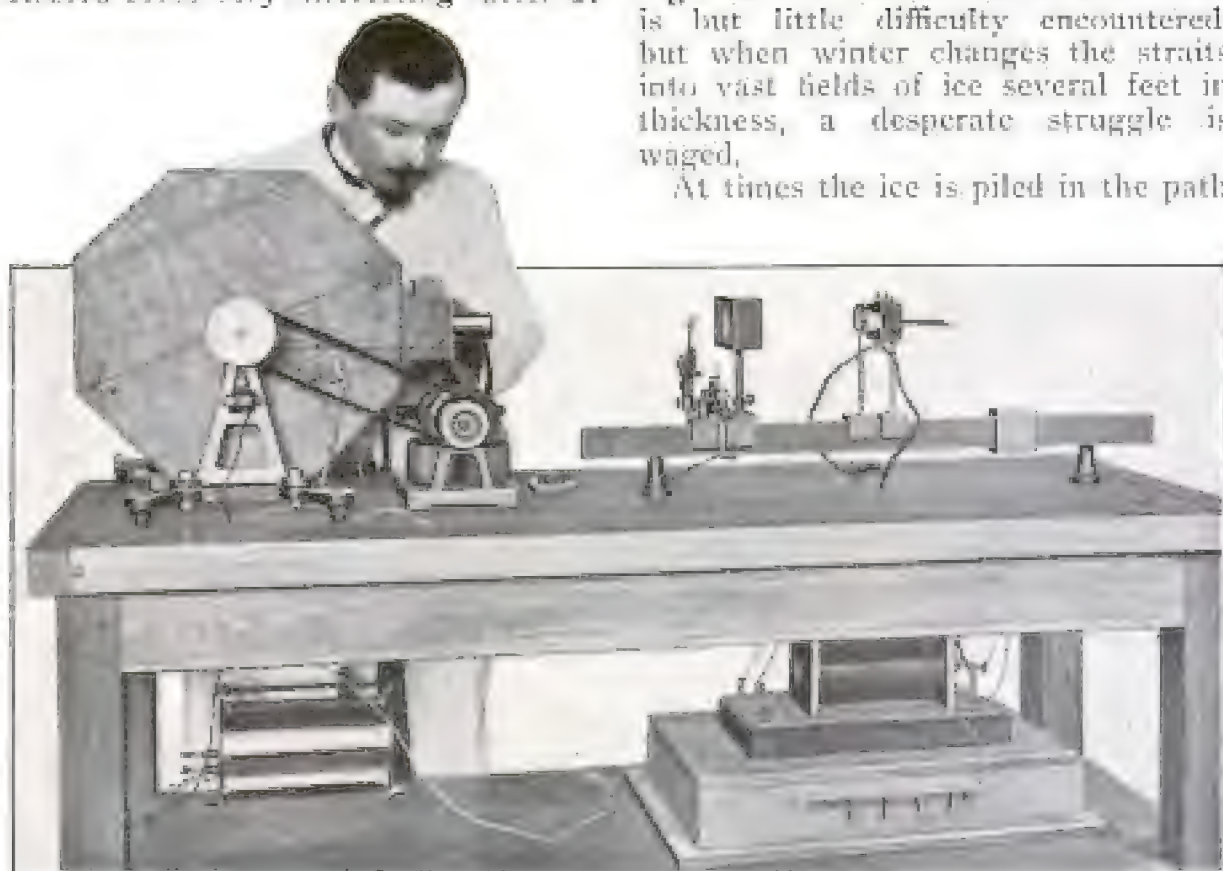
The admirable motion pictures obtained in this way have demonstrated some very interesting facts. It

is found, for instance, that the motion of the wings of all insects presents the same general character. Also that when flight is commenced, the amplitude of the first wing beats is much smaller than of the subsequent ones, but the period remains almost unchanged. The insect regulates the velocity of its flight, not by the rapidity of the motion of its wings, but by changing their inclination. Although in normal conditions the period of the wing beat remains constant, it may be increased or diminished by various influences, such as fatigue and cold.

THE LARGEST ICE-CRUSHER IN THE WORLD

Separating the northern from the southern peninsula of the state of Michigan is a narrow stretch of water, some eight miles across, known as the Straits of Mackinac. Of course, at all seasons of the year this necessitates the use of a car-ferry to form the connecting link. In the summer months there is but little difficulty encountered, but when winter changes the straits into vast fields of ice several feet in thickness, a desperate struggle is waged,

At times the ice is piled in the path



The Apparatus for Making Motion Pictures of the Flight of Insects



Largest Car-Ferry and Ice-Crusher in the World, Built for Service on the Great Lakes

of the ferry to the height of from 8 to 10 ft. In early days, a strongly constructed ferry with the cars towed on a vast scow behind was used, and later this gave way to a powerful ice-crusher that carried the cars on the lower deck. But still the problem remained unsolved until a few weeks ago, when the "Chief Wawatam" made its appearance.

This is by far the largest and most powerful ice-crushing car-ferry in the world. The new ferry is constructed of steel, and cost half a million dollars. It is 352 ft. over all, with 62 ft. beam, and a depth of 25 ft. All the machinery is below the main deck. On this deck are found four car tracks capable of holding 25 standard cars of 36 ft. in length. The ferry is equipped with three engines of 2,000 hp. each. Two of these triple-expansion engines are situated in the aft part of the ship and one forward. The ship is propelled by means of twin screws.

Robert Thelen, a Danish airman, is said to have been attracted to aviation by the opportunity it offered him for solitude, which he claimed he could not obtain on earth.

A MOTORCYCLE AND A SAVAGE

In describing a journey by motorcycle on the veldt near Johannesburg, British South Africa, one of the motorcyclists speaks of the excitement caused when they stopped for a rest at a Kaffir kraal. The Kaffirs had evidently never seen a motorcycle before, judging from the interest they took in the machines and the way they ran when one of the engines was started with the muffler thrown out. After much persuasion, one of the Kaffir boys was placed on the seat of one machine and a photograph taken.



A Kaffir Boy Bestrides a Motorcycle and has His Picture "Took"



X-Ray Photograph of Infant, Showing Broken Arm.
One of First Photographs of Entire Human Being



Detail is Brought Out so Well That Soft Bony
Tissue at Ends of Fingers is Shown



X-Ray Photograph of Broken Collar Bone—
Safety Pins were in Bandage



Remarkable Photograph of Foot, Taken with Shoe On, Showing Nails and Skeleton of Shoe



An X-Ray Handshake

The Perfected Wonders of the X-Ray

By G. E. CHAMBERLAIN

ONE of the world's greatest messages came in 1895. Couched in a most modest manner, Prof. William Conrad Roentgen's announcement of the discovery of the X-ray created intense popular interest. Roentgen himself was doubtless as thoroughly surprised at the popular acclaim as the remainder of the world was at his epochal discovery.

An obscure professor, with no greater hope than to live peacefully among his coils and test tubes, and to leave behind him a name honored by a few hundred of the erudite; in a single night Fate thrust him into the spotlight of the whole world's civilization.

Not only did the entire scientific world stop in its labors to critically investigate, and then, as it seemed, almost reluctantly do honor to this master workman, but the literary world, the commercial world, the laboring world, were each and all carried away with enthusiasm. Writers loosed their imaginations with the most weird and fanciful results, and it was a boon for the comic artists and jokesmiths.

Every working man held strong

views on the matter. Few things before or since have so grasped and held the popular fancy. Cathodes, anodes, Crookes tubes, and a score of other scientific terms were in common use. One result of this was that practically every person who could read any language had a fairly accurate idea of how the X-ray was produced and what it had accomplished.

Of course, within a few months this world wave of curiosity disappeared. Occasionally the public has been interested when some new use for the X-ray has been proposed, as for instance the cure of cancer.

Although we are indebted to Europe for the discovery of the X-ray itself, our own scientists and instrument makers have created such improvements and additions to the first crude device that it is today really an American product. The powerful instrument described in the following pages (the first photograph of which was taken especially for this article), has just been completed. It is claimed to be the most perfect of its kind and is the fruit of the inventive brain of two young

electrical engineers of Chicago. At first the production of a radiograph, or X-ray photograph, was a dangerous, painful, and laborious undertaking. The ray was generated by a static machine—a large wheel or circle of cut glass was revolved at a high rate of speed against silk rubbing pads, etc. When conditions were favorable a good spark could be made, and an X-ray photograph required from 10 minutes to perhaps an hour of exposure. At times the best static machines would absolutely refuse to do anything for days at a time. Today the perfected X-ray machine is as reliable and certain in its operations as a steam engine, and radiographs are taken by what may be accurately termed instantaneous exposures. No longer is the operator subject to the poisonous and almost incurable X-ray burns. The whole subject has been placed upon an efficient commercial basis—far superior to the photographic art as it existed, say, 25 years ago.

The different steps to these results may be readily traced and understood. It is essential for the production of the rays that a continuous current of high-voltage electricity be provided. If the static machine had not been so extremely erratic and uncertain, it would probably have been more highly developed. Because it was so unsatisfactory, however, development has proceeded along other lines. As high-voltage direct current can only be directly generated on a static machine and as it was desired to use commercial electricity, that ordinarily used for lighting, the process became slightly more complicated. Electricity is sold commercially in two forms, direct or continuous, and alternating. Direct current is that given off by a battery or by generators designed for that purpose, and it is usually found at 110 volts or 220 volts. For the production of X-rays, roughly 100,000 volts is required.

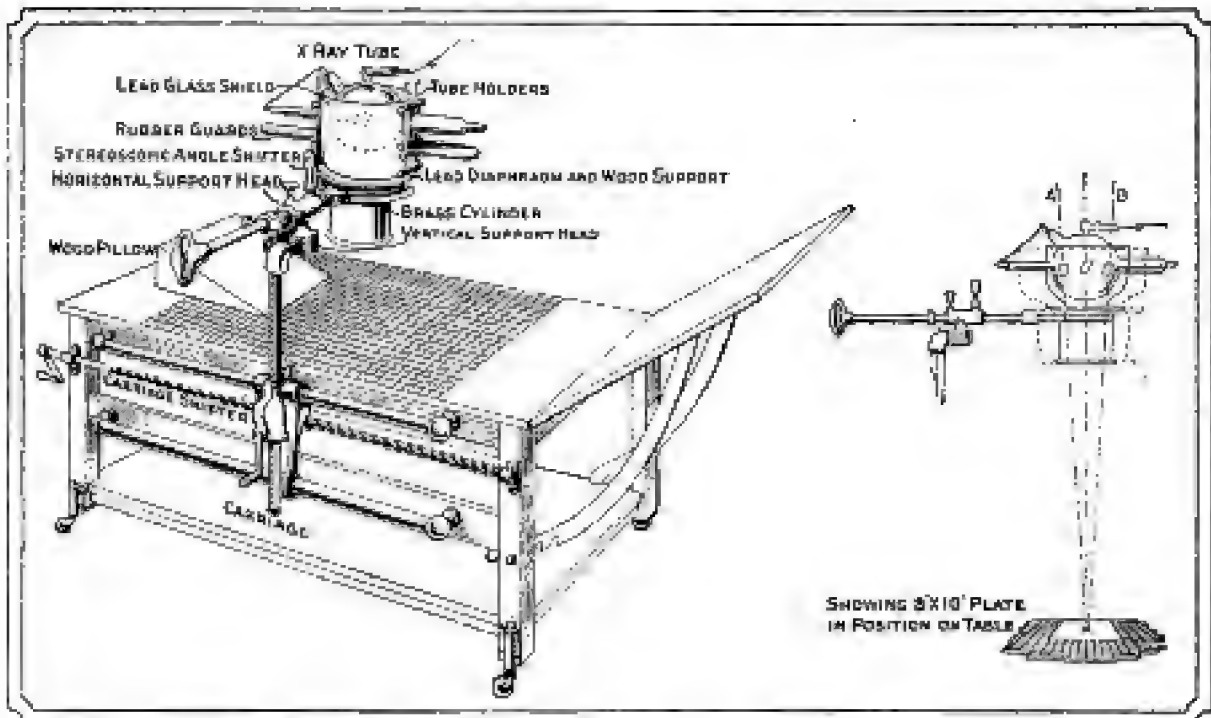
Direct current, as such, cannot be raised to this voltage. It must first be converted from a continuous and uni-

form flow into an interrupted or pulsating flow. As an illustration—a stream of water flowing quietly from a faucet is in a way similar to the movement of direct current. If you can imagine the same faucet being opened and closed at the rate of 40,000 times per minute then you get an idea of the movement of the pulsating current. Once the pulsating current is obtained, it is a very simple matter to raise the voltage any desired amount. After obtaining the desired voltage, the pulsating current must again be transformed into continuous current before being conducted to the Crookes tube.

The above results are obtained as follows: Direct current is used to drive a motor. This motor actuates an alternating single-phase generator. The current from the generator is "stepped up" to 120,000 volts. A large independent commutator is coupled to the shaft of the generator and this commutator transforms the high-tension alternating current into direct current—being directly connected to the generator, it is synchronous with it, and to one somewhat familiar with electricity it is a simple matter to understand how the electric pulsations can be picked up separately and, as it were, joined together into a continuous stream.

When the commercial current is alternating, the procedure is slightly different. The current is immediately transformed to 120,000 volts or thereabouts and is then commutated as before. But in this case the commutator is driven by a synchronous motor. A motor of this type must necessarily be in step with the central-station generator, and, being directly coupled to the commutator, the entire system becomes synchronous, that is, it all keeps step and the delicate and minute operation of picking out (3,600 positive pulsations per minute and reversing and joining to them an equal number of negative pulsations) becomes a simple and automatic process.

These two methods (which are in principle only one method) are the



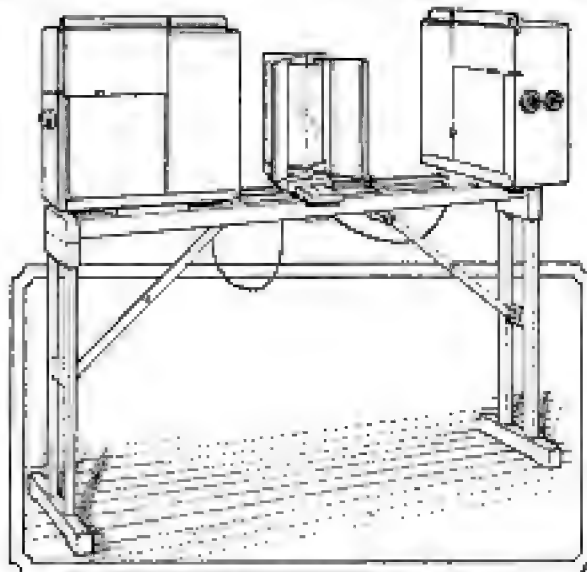
X-Ray Exposure Table, Checkered for Purpose of Locating Photographic Plate Accurately. Drawing on Right Shows How Stereoscopic Plates are Produced, Dotted Lines Indicating Positions of X-Ray Tube and Direction of Rays in the Different Positions

last word in X-ray development. By their use very considerable quantities of energy are employed in spark production, thus making rays more intense in action and accordingly quicker in results. The current produced in this manner is said to be entirely free from inverse currents.

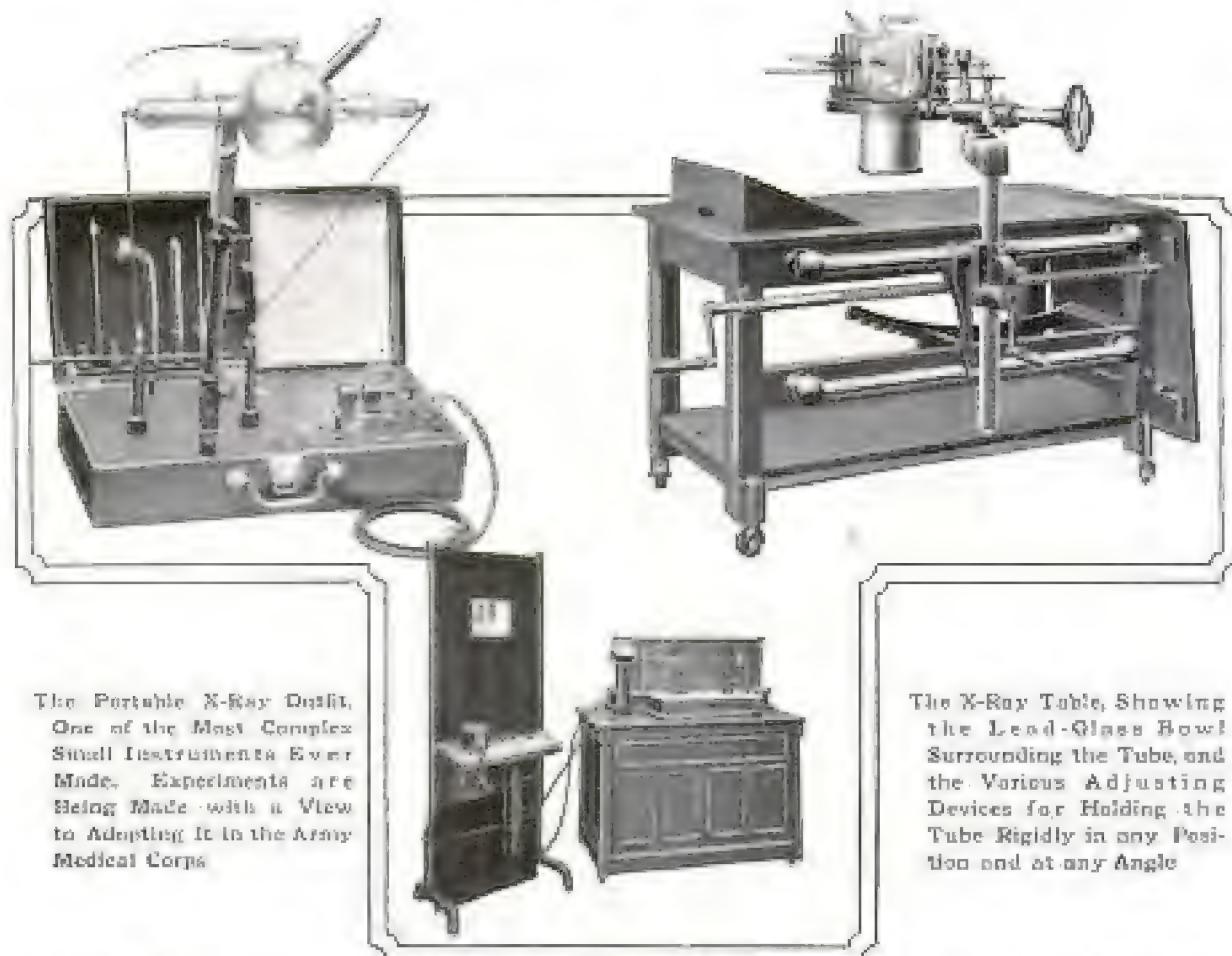
The vacuum tube is designed to focus all the rays at one distributing point so as to give a clear, distinct shadow on the sensitive plate. When inverse currents are present, they generate a second series of X-rays which are distributed from the opposite terminal in the tube and tend to render the shadow thrown on the sensitive plate indistinct and uncertain.

When this high-tension direct current is passed through the vacuum tube, X-rays are formed. Several refinements have been made in the vacuum tube. The tubes are exhausted to a high vacuum, varying from three millionths to one millionth of an atmosphere. The higher the vacuum the more volt-

age is required to develop the ray and the more penetrating is the ray itself. In use, the tenuity increases and the vacuum becomes so great that the tube does not respond to the current. To overcome this difficulty, a small glass chamber is fused to the tube and opens into it. This chamber is provided with a platinum terminal and is packed with a substance which



The Stereoscopic Apparatus by Which the Two Reflections of the Negatives are Blended into One Image. Plate Holders on Either Side are Provided with Electric Lamps Behind Plates to Illuminate and Project Radiographs onto Two Mirrors in Center. Intensity of Lights can be Adjusted to Correct Any Difference in the Plates. With This Instrument a Perfect Relief Effect is Obtained



The Portable X-Ray Outfit, One of the Most Complex Small Instruments Ever Made. Experiments are Being Made with a View to Adopting It in the Army Medical Corps

The X-Ray Table, Showing the Lead-Glass Bowl Surrounding the Tube, and the Various Adjusting Devices for Holding the Tube Rigidly in any Position and at any Angle

when heated will exude a slight amount of gas. Then when a tube fails to react to the customary voltage, the terminal of this small chamber is connected to the high-tension current for a few seconds. The heat thus generated combined with the electrolytic action causes a small amount of gas to be set free from the substance in the tube and slightly diminishes the vacuum. This process may be repeated time after time until the gas-producing material is exhausted.

Other improvements have been made in the tubes. The walls are heavier. The terminals are of very heavy copper and platinum, allowing the use of stronger currents without objectionable heating.

The increase in the actual energy consumed is remarkable. The total energy produced by the most efficient of the static machines was about 0.1 kilowatt per hour, or at the rate of 1/7

The Wonderful Interrupterless Apparatus and Lead-Glass Screen for Protecting Operator, with Switchboard Attachment

of a horsepower per hour. The modern machine consumes as

high as 40 amperes at 220 volts, or more simply, at the rate of 12 horsepower when radiographing a heavy subject.

The use of such intense and active rays would, under the conditions formerly prevailing, be extremely dangerous to the operator. In the modern apparatus, elaborate precautions are taken. Transparent X-ray-resisting screens are made of a special form of lead glass, in which 65 per cent of metallic lead is fused. The vacuum tube is set in a bowl-shaped receptacle of this glass, so shaped as to cut off all X-rays except those directly used for the radiograph. The switchboard is mounted on an iron-pipe frame at one side of the apparatus and is made of sheet lead instead of marble. The operator is screened from the rays by a heavy lead plate extending from the floor to above the operator's head. He

can see every part of the apparatus by looking through a lead-glass window set in the lead plate.

Elaborate, mechanically operated tables are used to support the patient being radiographed. A special mechanical contrivance permits the accurate production of stereoscopic plates. The first plate is exposed as usual. An automatic device actuated by springs instantaneously screens the exposed plate, exposes a fresh plate in exactly the same location as the first one, and shifts the X-ray tube $2\frac{1}{2}$ in. to one side, giving a different angle to its rays. So perfectly does this mechanism operate that the total time required for the two exposures and the change of plates is not more than 2 seconds. For the study of stereoscopic plates, another remarkable device, called the Wheatstone stereoscope, is used.

The plate holders accommodate accurately any size plate from 4 by 5 in. to 14 by 17 in. These plate holders are provided with electric lamps behind the plates, so arranged as to illuminate the radiograph brilliantly. The intensity of these lights can be adjusted so as to

correct the differences of plates of different detail and strength of development. In the center of the apparatus are two mirrors joined at the edge toward the observer and at right angles with each other. Thus, when standing directly in front of this double mirror, both plates are seen at once. The mirror holders are moved backward and forward until the two reflections grow together and a perfect relief effect is obtained, everything standing out in space. The action is the same as in the common stereoscope with which all are familiar, only in this instance it is turned to a very practical account. A single radiograph might show a bullet lodged in the body, but it would not show how deeply. The second radiograph taken at a different angle by itself would give no more information than the first one. But bring the two plates together in the stereoscope, and the bullet is shown in its exact position. Or we may say that while the simple radiograph gives length and breadth, the stereoscope gives thickness, and is now as indispensable to the surgeon as the X-ray itself.



THE GRAY SHIPS

W. J. Lumsden, in the *New York Times* on the occasion of the recent fleet review in the Hudson River

A long, gray line of steel-clads
Stretching along the stream
That moves past the peaceful city
Like a spirit in a dream:
A long, gray line of steel-clads
Swinging to ebb and flow,
With the doves of peace at the mastheads
And the dogs of war below.
A long, gray line of steel-clads
Softly at anchor ride,
With the homes of peace and plenty
In touch on either side:
A long, gray line of steel-clads
Whose sailors come and go,
With the doves of peace at the mastheads
And the dogs of war below.

A long, gray line of steel-clads
At rest in the morning sun
Like the giants of battle idling
When their labor has been done;
A long, gray line of steel-clads
At rest in the twilight glow,
With the doves of peace at their mastheads
And the dogs of war below.
A long, gray line of steel-clads
Fringing the river shore,
Asleep by the side of the city,
At peace forever more:
A long, gray line of steel-clads,
Where rude winds never blow,
With the doves of peace at their mastheads
And the dogs of war below.

ELECTRIC LAMP AND FLATIRON IN ONE



A Glass Electric Fixture That Serves as a Lamp,
a Flatiron and a Stove

An electric fixture which is a lamp and a flatiron or stove at the same time has been patented by an inventor living in Houston, Texas. The flatiron is made of glass, and the unit it contains provides illumination as well as the heat required for ironing. Placed upside down on a rack, the flat bottom of the glass flatiron serves as an electric stove and as an illuminating unit. Thus the same fixture answers for light and heat, and the glass provides perfect insulation.

A new process of preserving cheese from mold has been evolved in the application of a coating of paraffin to the finished cheese. This does not find favor with European buyers of American cheeses who regard the mold as one of the distinguishing marks of excellence.

BROOKS' COMET—AN ASTRONOMICAL VISITOR

While sweeping the eastern heavens on the night of July 20, 1911, the veteran American comet-hunter, Prof. William R. Brooks, of Geneva, New York, found a new comet, bright enough to be visible in a 3-in. telescope. The summer has been prolific in cometary discoveries, six of these objects having been found since the beginning of July; and on several occasions it has been possible to see with the naked eye two comets in the same part of the sky. Of these comets the one discovered by Professor Brooks and named after him, has been the brightest and of most popular interest: on favorable dates it has almost equaled Halley's comet as seen in the morning sky early in May, 1910. The head has reached a brightness nearly equal to that of a second-magnitude star, and at times not less than 20 degrees of tail could be traced by the unaided eye.

The orbit has been for convenience computed as a parabola, but it is in reality probably a very long ellipse,

which the comet requires hundreds or thousands of years to traverse. It has recently been demonstrated by Ström-gren, of Copenhagen, that all cometary orbits are ellipses, whence it follows that they have been members of the solar system from an indefinite past, perhaps from the beginning of the history of our sun and its attendants.

Toward the end of August the comet became visible to the eye, at first as a faint, fuzzy spot nearly overhead in the early evening. Its northerly motion brought it within 33 deg. of the pole, so that it could be observed throughout the night during the first part of September, but to best advantage in the evening and morning.

At perihelion, or point of nearest approach to the sun, on Oct. 27, the comet was distant from it 45 million miles; on Sept. 17 it was almost as near as that to the earth—which is pretty close, astronomically speaking.

The spectrum resembled that of Halley's comet, showing the presence prin-



BROOKS' COMET MAKING A NEIGHBORLY CALL

Half a Million Miles in Diameter, This Stupendous Astronomical Visitor Came within About 45,000,000 Miles of the Earth, Which is Very Close, Astronomically Speaking. Photograph was Taken by Professor Barnard at the Yerkes Observatory. The Streaks are Stars, Drawn Out by Motion of Telescope in Following Comet

cipally of carbon vapor and cyanogen. The photograph reproduced here was obtained by Professor Barnard at the Yerkes Observatory with a 10-in. photographic telescope on the evening of Sept. 22, with an exposure of $3\frac{1}{4}$ hours. The diameter of the head was then half a million miles, and the tail could be traced on the original negative to a

distance corresponding to 15 million miles. The images of the stars, normally round dots, are drawn out into streaks by the observer's steady motion of the telescope in guiding it upon the moving comet. During November the comet has moved rapidly southward and can no longer be observed from the northern hemisphere.

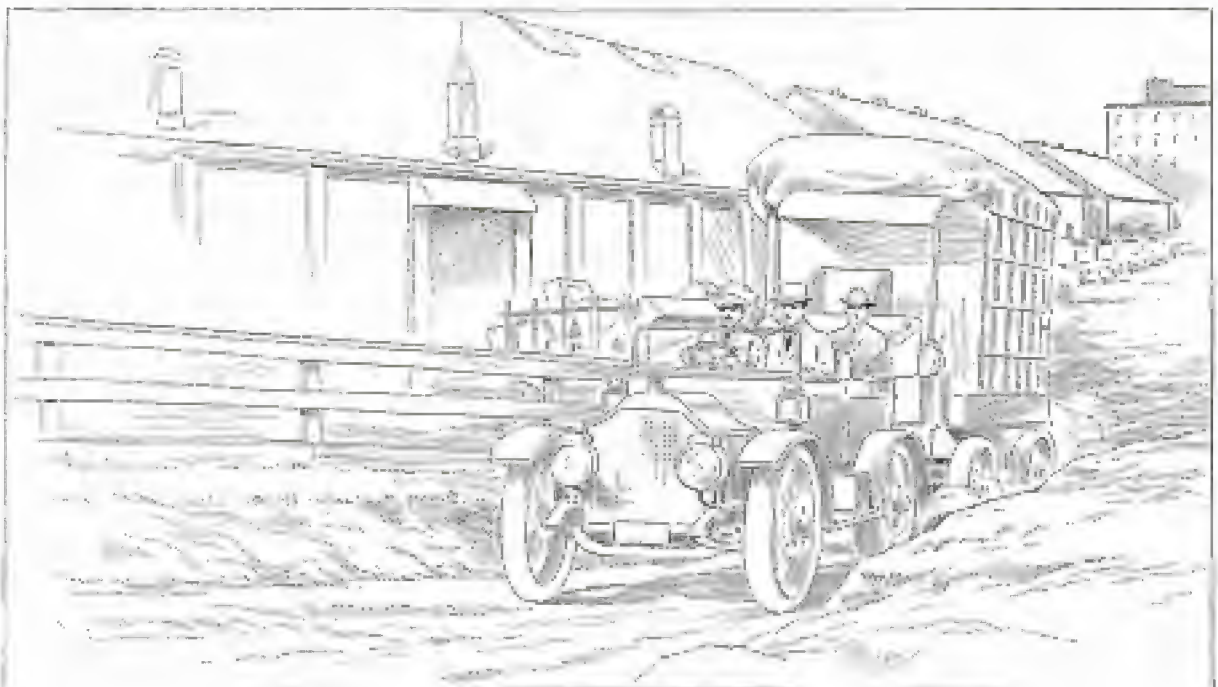
"TROUBLE CAR" FOR MOTOR TRUCKS

A large number of motor delivery trucks are now being used in the business of a great department store, in Chicago, and, as such trucks sometimes suffer mechanical mishaps, a special "trouble car" and crew is kept in readiness to answer calls for assistance. This "trouble car" is a light 30-hp. machine, accepted after a rather interesting test. The selection of the car depended upon its ability to drag a 5-ton truck up a 10-per-cent grade on a rather badly rutted road. Only one car agency entered the competition, and this agency had to try three times. The first two attempts were failures because the motor could not get action in the ruts, but in the last attempt, two men rode on the run-

ning boards and three rode in the tonneau. This weight gave the machine the necessary grip on the ground, and the big truck was slowly dragged up the grade.

STEALS MESSAGE WITH A MEGAPHONE

The use of a megaphone and a set of vibrating instruments to steal telegraph messages from another set of instruments was brought to light in the investigation of a most unique case of wire tapping. The stealing of the messages occurred in a broker's office. It was observed by a brokerage firm in San Francisco that another firm in the same city was using quotations which the first firm received on a private wire. The investigation led the detectives to Salt Lake City, where they found that



"Trouble Car" Hauling a Five-Ton Truck Up Grade on a Rutted Road

in the office of a correspondent of the first broker a megaphone had been set up through which the clicks of the telegraph instrument were transmitted to another office by a vibrator and thence by telegraph to the office of the firm in San Francisco. The brokers were arrested and released on bail, but the officers of the government found themselves in a quandary as to the method of prosecution, as there was no actual wire tapping. Under the Utah law, a person who takes from the wire a message not intended for him and converts it to his own uses is subject to imprisonment from one to five years, or a fine of not more than \$1,000.

SMALLEST BATTERY RUNS VEST-POCKET LAMP

What the inventor claims is the smallest practical storage battery in the world has just been placed on the market in France in connection with a vest-pocket electric light. The battery which actuates the light weighs $1\frac{3}{8}$ oz., is but $\frac{2}{3}$ in. thick, 2 in. high and $2\frac{1}{2}$ in. wide, and has current sufficient to provide light for six hours continuously and for a much longer time, if used intermittently. The battery and light are placed in a receptacle that is not much larger than an ordinary



Self-Contained, Vest-Pocket Lamp has Smallest Practical Storage Battery

watch and can be carried in the vest pocket. The battery can be used to actuate small mechanical toys as well as to light the pocket flashlamp.

A BABY RAFFLE IN PARIS

A raffle in which the prizes were babies took place recently in Paris. The management of a foundling hos-



A Raffle of Live Babies at a Foundling Hospital in Paris

pital held the raffle, with the consent of the authorities, as a means of finding homes for a large number of its charges, and to raise money. The proceeds of the raffle were divided among several charitable institutions. An investigation of the winners was made, of course, to determine their desirability as foster parents.

¶ In London, recently, considerable attention was attracted to the funeral of a taxicab chauffeur by the fact that the cab he had been driving was placed in the funeral procession just behind the hearse, and directed by a fellow chauffeur, followed the remains to the cemetery, just as the riderless horse follows the remains of his master in a military funeral.

THE PANAMA-PACIFIC-EXPOSITION SPADE

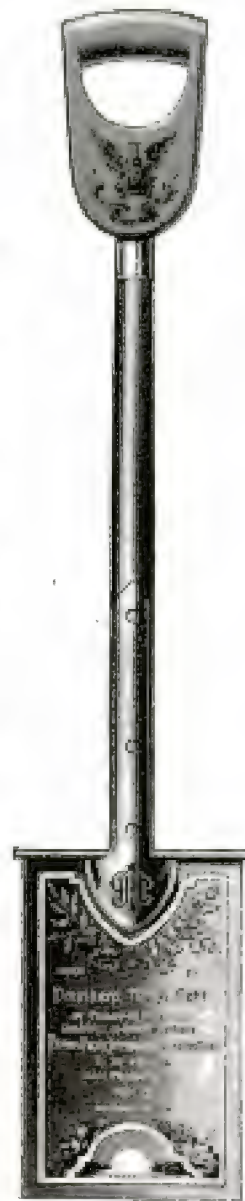
The spade used by President Taft in turning the first spadeful of earth for the Panama-Pacific Exposition to be held in San Francisco in 1915 is a beautiful piece of work. In shape and size this spade is a perfect duplicate of the implement in common use, but the blade is made of pure California silver, and the hand grip is also composed of solid silver. The inside of the blade is inlaid with pure California gold, and bears an inscription telling the purpose for which the spade was made. Below the inscription is a view of the Golden Gate entrance to San Francisco with a rising sun as a background. The only part of the spade not made of precious metal is the handle, and that is of red-wood.

THE DRIFT OF BOTTLE MESSAGES

The world's record holder for bottle messages, according to the Nautical Gazette, is Captain A. Simpson, a Scotchman until recently in command of a steamer trading between London and Australia. During the past 25 years, he threw more than 10,000 bottle messengers into the ocean, and of these more than 1,000 were picked up. Some of his bottles set adrift near Cape Horn were found on the southern coast of Australia, after drifts of from 10,000 to 15,000 miles at an average daily rate of 10 miles.

An American who has been an extensive experimenter with bottle messengers is C. F. Keelnast, first officer of the steamer "Cherokee," of New York. Out of about 5,000 bottles dis-

patched by him, in co-operation with the Washington Hydrographic Office, about 350 have been returned. The longest drift of any of these was about 6,000 miles in 1,698 days. The drift of such bottles afford intimations as to sea-surface currents, thus being valuable scientifically as well as a source of personal interest to the dispatcher of the messages.



Silver Spade Used to Turn First Sod

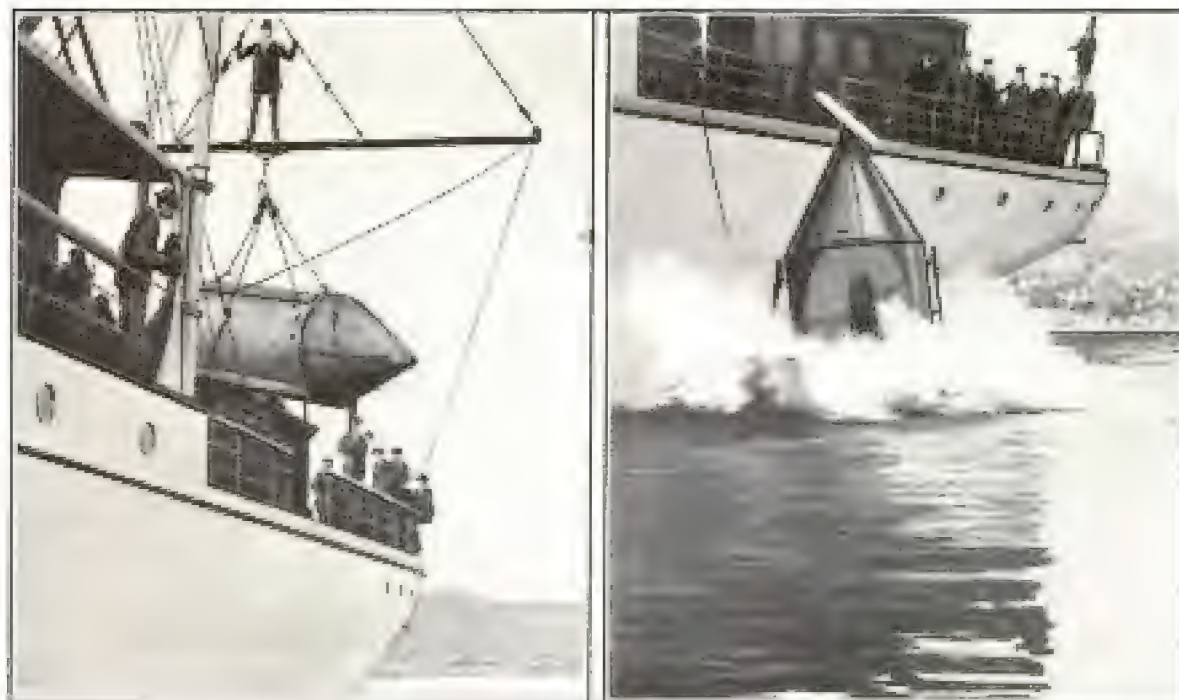
AN IMPROVED METHOD OF MAKING STEEL

Attention is being drawn to a new German steel-making process in which the steel, although made without crucibles, is said to be equal in every point to crucible steel. One of the most important qualities of this process is that the steel shrinks only half as much as ordinary cast steel, the product thus equaling crucible steel in the open-hearth furnace.

The claims made for the process are that the construction and working of the furnace is simplified; that the heat can be controlled more quickly and more exactly in the open hearth than with ordinary firing; that intermittent working is facilitated, the furnace being quickly brought to full heat after standing idle; that the charge is kept in a perfectly liquid state, so that it is not necessary to use the last of the contents of the furnace for ingots; and that the charge can be melted and treated more

quickly than by the ordinary method, thus adding to the output of a furnace of given size and also reducing the cost of labor.

Plants have already been established in Germany, Sweden, and Scotland, the latter having a capacity of 6,000 tons of steel per year and costing \$150,000. An English plant is also planned.



Ready for a Dive from Its Cradle

Diving into the Sea with a Load of Human Freight

CYLINDRICAL MOTOR LIFEBOAT DIVES FROM SHIP

After 20 years of work and many disappointments, an inventor at present in Toronto, Canada, believes he has perfected a non-sinkable, non-capsizable, motor-driven lifeboat whose launching from a ship is in the nature of a dive. The boat looks like an exceptionally corpulent cigar, and comprises a cylinder within a cylinder. The outside cylinder, which revolves freely with the action of the waves, is 24 ft. long and 7 ft. in diameter. The inner cylinder, or cradle, in which the passengers and the propelling mechanism are carried, is 6 ft. in diameter and 18 ft. long, suspended at its two ends by the bulkheads situated at the cone ends of the outer cylinder or shell. No matter how violent the rolling action

of the outer parts, it is claimed that the passengers are guarded against it by the force of gravity acting upon their cradle. It is likewise claimed that 40 persons may be carried.

The problems of providing fresh air, expelling the exhausted air, and driving the strange craft by motor power, are met in the following manner: The bearings leading into the inner cradle have a hollow center, through which is run an air tube with the outer

end curved upward about 2 ft., so that it is well above the water. At the inner end of the tube is a small pump which, worked by the passengers, draws in the fresh air. The exhausted air is expelled by an ingenious arrangement of valves which automatically close



Passengers within the Non-Capsizable, Non-Sinkable Motor-Driven Lifeboat

when the cylinder to which they are attached revolves them beneath the water level. A number of these valves are always above the waterline and open to the air. In the engine installation, the exhaust is carried through the bearings to the open air. The operation of the propeller through the turning outer shell is simple. The propeller connection with the engine situated within the cradle depends entirely upon gear wheels. Therefore, it revolves entirely independent of the

relative position of the inner and outer cylinders.

One of the most important features claimed for the boat as it now stands is the fact that, instead of having to be lowered over the ship's side by tackle, where it would be in danger of being crushed by the heavy seas, it rests in a cradle from which it slides and dives into the sea when released. In the tests given at Toronto, the boat, carrying passengers, was launched into the water as shown in the illustrations.

NEW DESIGN FOR LETTER BOXES

A new style of street letter box has been adopted by the Postoffice Department, and will be installed throughout the larger cities of the country within the next year. It is to be mounted on a fluted wooden or iron pedestal, and by postal authorities is considered a great improvement over the boxes fastened to lamp posts.



The present style of letter box opens on the side, and the carriers cannot see the interior without difficulty, so that to prevent overlooking letters they have to feel around with their hands. In the new box the face or front falls to the level of the bottom of the receptacle, exposing every part of

the interior to the view.

A lamp purchased in Chicago for \$12 by a citizen of Paraguay, cost the purchaser a total of \$69.15 before he received it by freight from its manufacturer.

TURN OF LEVER KILLS MAN QUARTER MILE AWAY

"Death by long distance" is perhaps the most peculiar of accidents. Patrick Gaul, of Lackawanna, N. Y., was killed recently through someone accidentally touching a lever a quarter of a mile away from where his death occurred.

He was working in a manhole at the Lackawanna steel plant, when the cover suddenly clanged down on his head. The manhole cover, which is operated by steam from the boiler house of the plant, weighs 500 lb., and is opened and closed by slight turns of a lever. Someone had turned the lever, not knowing the man was working inside the hole.

MONSTER MOTOR TRUCK TO CARRY SCENERY

The management of a circuit of theaters in New York City has acquired a unique type of motor truck, which is one of the largest in the world. It is claimed to have the greatest wheel base ever used on a motor truck, 34 ft. over all, outside length, is 12 ft. in height, and has inside measurements sufficient to accommodate stage-width scenery. On either side of the body, 10 ft. in height, are reproductions in color of two of the theaters in the circuit.

The motor truck was built for the transportation of scenery and stage furniture between the theaters. The



Monster Motor Truck Designed for Transportation of Stage Scenery between New York Theaters

movement of scenery from one theater to another has usually to be accomplished between Sunday and Monday, and the ordinary means of transportation proved inadequate. The equipment of the car includes a number of unusual appliances for the handling of large pieces of scenery.

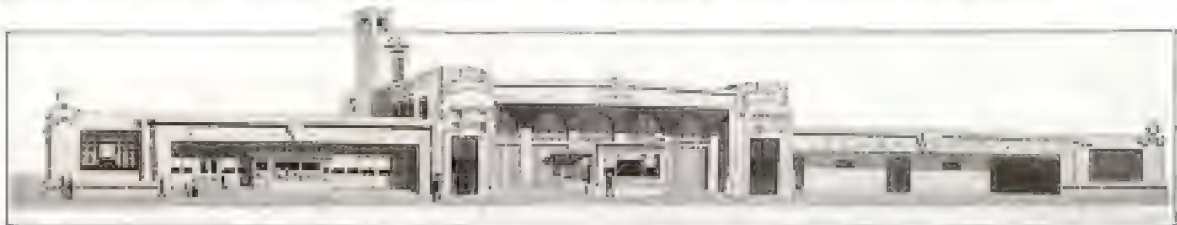
RAILROAD STATION BUILT OF MINE WASTE

A striking example of what may be done with the waste of zinc and lead mines has been demonstrated in the construction of the new union station at Joplin, Mo., the concrete of which is largely made up of flint and limestone tailings taken from the waste piles of the mines in the district. Of

the 22 parts in the concrete mixture used in constructing the station, 15 parts came from the mines, 10 parts being average tailings, and 5 parts the fine tailings from the sand jigs, called Chitwood sand. Of the remaining seven parts, three were of river sand and four of cement.

The center portion of the station, built in the old Roman type of architecture, is two stories high. The train sheds and platforms cover 25,000 sq. ft.

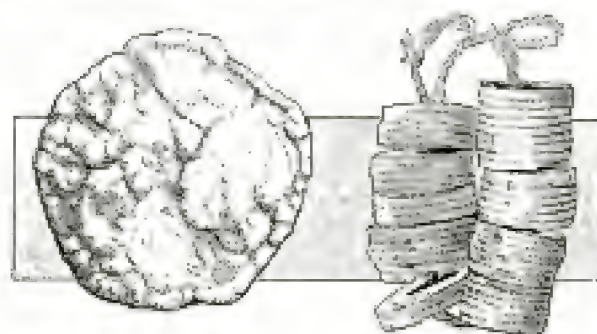
¶The officials of the Bureau of Census estimate that there is an investment of more than \$256,000,000 represented in the manufacture of agricultural implements in the United States, giving employment to 59,764 people.



Waste from the Zinc and Lead Mines of Joplin, Mo., Went into the Construction of This Reinforced-Concrete Union Station

CURIOUS FOREIGN BREADS

Two curious breads, one Turkish, and the other Japanese, the first delicious, and the second not recom-



Turkish "Oven-Flopped"
Bread

Japanese Bread Strung
Like Buttons

mended, are shown in the accompanying illustrations. The Turkish bread, which is "oven-flopped" and is shaped like certain kinds of American biscuits, is claimed to have an exquisite, appetizing, grain-like flavor, found very seldom in American breads. In making

it the baker takes a piece of dough, deftly whirls it around atop his finger for a moment to give it a pancake form, then throws it "flop" into the oven against one of the heated walls. It adheres there for a moment, bakes, expands, drops automatically onto its other side on the oven floor, and, just as it is browning nicely, is dragged out at the moment another is "flopped" in. The time consumed in the baking is about two minutes.

The Japanese bread, strung on a string like buttons or Chinese money, is much used with tea drinking and in soups.

¶The municipal authorities of Hamburg, Germany, have authorized the construction of a 3-mile line of track on the Scherl monorail plan, to test the adaptability of the monorail with a view to installing it on the municipal traction system.

STEAMBOAT CENTENNIAL ON THE MISSISSIPPI

The celebration of the centenary of steam navigation on the western rivers brought to Pittsburg a distinguished company of men and women from all sections of the United States, including President Taft and representatives of the families of Nicholas J. Roosevelt, a great-uncle of the former President, Robert Fulton and Chancellor Livingston of New York. The first named was the builder of the first steamboat used west of the Alleghenies and the two latter supplied the money and plans for the boat. The most spectacular feature of the celebration was a river parade of more than 100 boats of all types and sizes, headed by a replica of the "New Orleans," the boat built by Roosevelt. This unique craft was thus started on a triumphant voyage to New Orleans, being received and honored by a score or more of cities and towns along the route.

One of the events of the Pittsburg celebration was the christening of the new "New Orleans" by Mrs. Alice Roosevelt Longworth.

In comparison with the leviathan steamers of the Mississippi of today, and the smaller ones of the Ohio and its tributaries, it was a modest affair. The "New Orleans" left on its long voyage down the Ohio and Mississippi on the morning of Thursday, November 2nd.

The original "New Orleans" was built at Pittsburg on the banks of the Monongahela, in 1811. A comparison of the little boat with the magnificent passenger steamers of the rivers today reveals the immense advance of marine construction during the last one hundred years. The "New Orleans" was 138 ft. in length and 26 ft. beam, with a keel of 116 ft. She was of only 400 tons burden and carried an enormous smokestack and two masts, with sails, for the builders, Fulton and Roosevelt, believed canvas would be necessary in coming up stream. Steam power was then in its infancy.

There were two cabins, box-like affairs: one of four berths aft for ladies, and one forward for men. The engine

CENTENARY OF STEAM ON THE WESTERN RIVERS



Some of the Modern Steamboats Lined Up at Pittsburg

Passengers on the "New Orleans" in Costumes of the Years Ago

Mrs. Alice Roosevelt Longworth Christening the "New Orleans"

Photo by the Johnston Studios, Pittsburg, Pa.

Replica of the "New Orleans," the first steamboat to navigate the Western Rivers. Built at Pittsburg by a Great-Uncle of ex-President Roosevelt

was a primitive piece of mechanism with a 34-in. cylinder. The vertical wheel was the invention of Roosevelt and was the same type that made Fulton's "Clermont" perform its celebrated ascent of the Hudson in 1807. The "New Orleans" cost \$38,000. Her maiden voyage in 1811 terminated at Natchez. The following year she went the whole distance from Pittsburg to the Crescent City, but two years later struck a snag near Baton Rouge, and sank.

The largest passenger steamer on the Ohio today is in the service of a Pittsburg and Cincinnati line. Her construction is the last word in river boats. In length she measures 236 ft., beam 44 ft., and is 7 ft. deep. She is

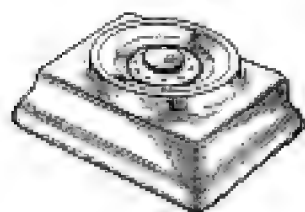
rated at 1,200 tons burden, and her engines are 1,600 hp.

The interior build and finish of this boat is magnificent. In the grand salon mahogany is used, with ceiling of pressed steel, and plate mirrors are abundant. This salon is 200 ft. long and 15 ft. wide. All the staterooms, which are equipped with the most modern toilet and sanitary appliances, are on the outside. The lighting is by electricity throughout.

This steamer makes a trip every year, carrying visitors to the Mardi-Gras at New Orleans. The distance from Pittsburg to that port—2,000 miles—is covered in a week going downstream, which is remarkable time for a steamboat.

HEAVILY ARMORED JEWEL SAFE

An ingenious jewel safe, designed to be securely fastened within a drawer or to the top of a dresser or desk, has made its appearance on the market. It is very heavily armored, with a combination lock



set in a circular door which lifts completely out when the lock is operated, leaving a convenient hand hole.

COPYRIGHT INFRINGED BY MOVING PICTURES

Copyright of stories and books applies with the same force to the dramatization of the idea or plot for the moving picture as for the theater. Decision to this effect was reached by the Supreme Court of the United States after hearing arguments presented by representatives of the moving-picture interests and the owners of the rights to the original book. The story in dispute was "Ben Hur." A moving-picture company sought to produce a film drama of the story and employed a man to read the book and devise a

scenario. The pictures were made and shown and then suit was filed against the concern. The allegation in the suit was that the copyright was being infringed by the moving-picture concern and that no application for permission to use the story had been made by the moving-picture people. Testimony was produced to show that a theatrical firm had purchased the right to make a play of the story and had produced the play throughout the country. The case was decided against the moving-picture company in the trial court and an appeal was taken to the Supreme Court of the United States. This court affirmed the decision of the lower court. The court held that the infringement was not of the copyrighted book or the drama, but of the author's exclusive right to dramatize his own writings and publicly to perform that dramatization. The decision of the court is regarded as of the utmost importance to moving-picture concerns.

☛ "American" automobiles for the English trade will be made in England hereafter by at least one United States manufacturer, a plant for the purpose having recently been set up in Manchester.



Members of the "Borrowed Time" Club of Oak Park, Ill., Listening to the Voices of Deceased Members

VOICES OF THE DEAD ARE HEARD AT UNIQUE CLUB

Voices of the dead were heard recently in song and story at a meeting of the "Borrowed Time" Club, a novel organization of elderly men in Oak Park, one of the suburbs of Chicago. The voices came to them as they had heard them in life, the medium being a phonograph.

The first records put on the machine were those left by "Father" E. F. Robbins, the organizer of the club, who died two years ago. The old men, some of them almost deaf, leaning forward with their hands behind their ears so as not to miss a word, heard a familiar little hacking cough, and Father Robbins' voice began singing

a familiar hymn. Then he told a little about his life. The other records heard were those of E. W. Hoard, another charter member, who died three years ago at the age of 93 years. He sang the hymn, "There Is a Land of Pure Delight."

The "Borrowed Time" Club was organized in 1902 in the harness shop of "Father" E. F. Robbins, and is composed of men who have passed 70 years of age and are living on "borrowed time." Of the 25 charter members, 15 have died. It is the intention of Philander Barclay, the historian of Oak Park, to take records of the members of the club now living.

LOWELL THEORY OF FROST ON MARS

In further support of his theory regarding the probable existence of vegetable life on Mars Prof. Percival Lowell, of the Flagstaff Observatory, has announced that during the first two weeks of November observations made by him assure him of the occurrence of frost on the planet. It will be remembered that Professor Lowell

is the firmest advocate of the theory that Mars is inhabited, and he built a splendidly equipped observatory at Flagstaff, Arizona, for the purpose of investigating this planet. His observations have resulted in the formulation of a theory in logical sequence beginning with the discovery of filmy substances he states are clouds which

appear from time to time over the planet, thus giving evidence of the presence of moisture which creates and nourishes the vegetable life the observer believes he has seen. Further than this he has also announced the existence of icebound poles similar to the poles of the earth, and it is his theory that the canals on Mars were dug by the inhabitants of the planet for the purpose of carrying away the water resulting from the melting of

the ice at the poles under the influence of the sun. These deductions from thousands of observations as recorded on hundreds of photographs, Professor Lowell contends support his theory. His newest photographs and observations, as stated, have convinced him of the occurrence of frost. Many astronomers take issue with the theories of Professor Lowell as to the Martian canals and the existence of vegetable life.



AN AEROPLANE-EYE VIEW OF A DREADNOUGHT

Photograph of the battleship "Florida" as she was being towed to her position in line at the big naval review in New York Harbor, October 31-November 2. There were five tugs used to straighten the vessel out into the East River, two in front, one on each side and one in the rear. The picture was taken just as the big ship passed under the Brooklyn Bridge.

¶Ralph Mulford was the victor in the annual Vanderbilt cup race held at Savannah, Ga., Nov. 27, driving his car 291.38 miles at the rate of 74.07 miles an hour, which constitutes a new record for this race.

WORLD'S LARGEST ELECTRIC GENERATOR

The largest electric generator in the world was installed recently in the Waterside station of the New York Electric Company under conditions which furnished as dramatic and spectacular a setting as could be imagined by any playwright. An assemblage of prominent men had gathered to attend the ceremonies incident to its starting. Opposite the monster creator of electric power stood seven huge vertical engines, an older type of generating apparatus, whose work was to be done by the single steam-turbine unit. One by one the vertical engines were brought to a stop and the entire "load" gradually transferred to the big turbine. A few years ago these vertical engines were considered the last word in electric generating. To-day one turbine, which takes up but a little more floor space than a single steam engine, is substituted for them.

This great generator has a capacity of 30,000 hp., sufficient to supply all the current for an up-to-date city of 250,000 population. Its power is equal to that of some of the greatest of the ocean liners or 30 express locomotives. It weighs 420 tons and consumes daily 400 tons of coal.

¶Birmingham, England, has a school for training of hardware salesmen, a special course for this purpose having been established at the Birmingham Technical School.



A STEAM-TURBINE ELECTRIC GENERATOR OF 30,000 HORSEPOWER

It replaces seven vertical engines, the size of each of which equals this unit, and generates power equal to that of the "Campania," one of the ocean greyhounds, or 30 express locomotives. It consumes 400 tons—a good trainload—of coal, every 24 hours.



A THEORY BECOMES A FACT

The first actual test of the aeroplane as an offensive weapon and an engine of destruction in warfare occurred a few weeks ago when Italian aviators guided their machines over Turkish troops and Arab camps, dropping bombs with deadly effect and striking terror to the hearts of the Moslem soldiers.

WAR AMONG THE DATE PALMS OF TRIPOLI



1, Italian Sharpshooters Drawing the Fire of the Enemy—2, It is Estimated That \$30,000 Worth of Ammunition was Used by Italian Gunners to Silence This Old Turkish Mortar—3, Prophet's Tomb Held by the Italian Troops—4, An Incident Which the Italian Censors Kept Dark, an Italian Warship Sinking off Tripoli, Riddled by Turkish Shells—5, Maxim Gun Mounted on an Automobile by Turks.

AUTOMOBILE PROGRESS AT ENGLISH SHOW

Strongly reminiscent of the golden age of motoring, when the year's progress as exemplified at the annual shows of the industry, in different great capitals of the world, was a matter for the most phlegmatic to rave over, was the recent English exhibition, just closed in London.

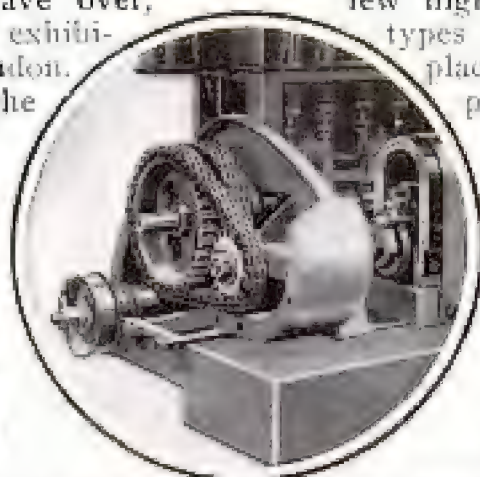
Certainly it was the consensus of opinion, among the engineers and experts who attended, that this was the first show in a number of years at which real progress was in evidence, and upon no reasonable basis could it be denied that the cars shown fairly bristled with novel and interesting features, many of which offered every evidence of becoming permanent fixtures in motor-car practice.

First among the improvements must be listed the achievement of

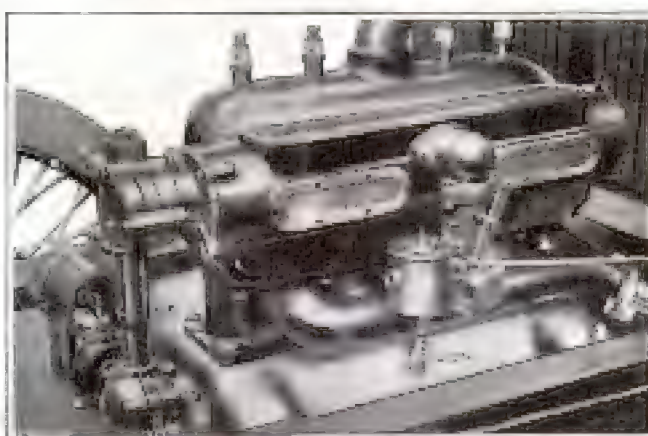
silence, which has come in a manner doubly meritorious, in that it has involved, incidentally and otherwise, additional important advances. Chief among these is the substitution, in a few high-grade cars, of various types of sliding valves in the place of the long-established poppet valve.

Of the types of motors with sliding-sleeve valves, there are now at least a half dozen well-tested examples on the European market, and their advantages, in respect to reliability, durability, high power, and economy, are proved past all questioning.

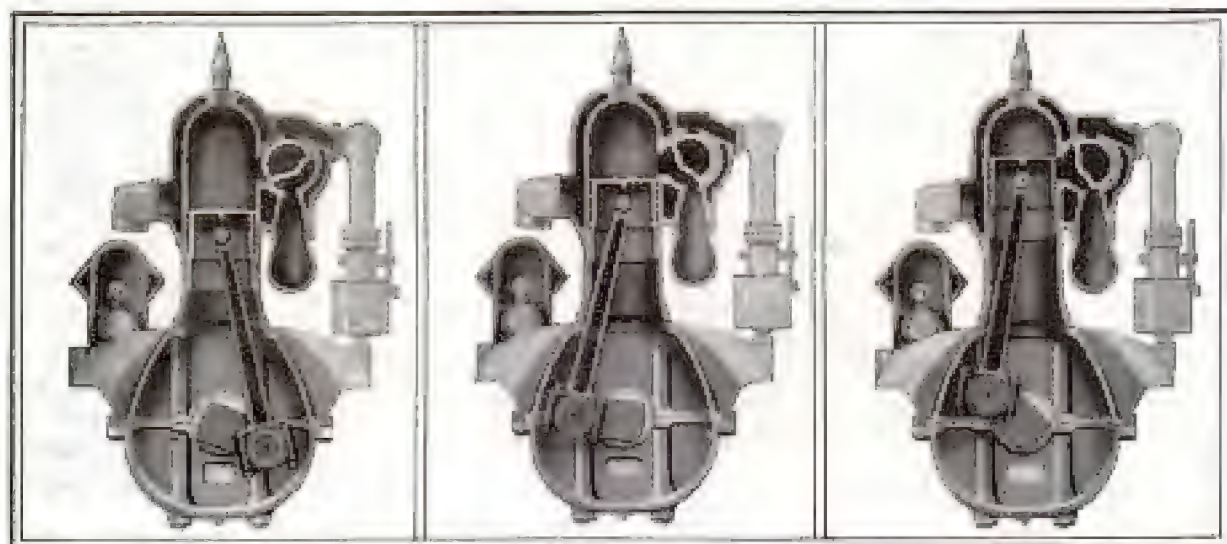
A most interesting and apparently a successful attempt on the part of a famous French manufacturer, to evade the complications of, as well as the patents on, the sleeve-valve constructions, is illustrated here-



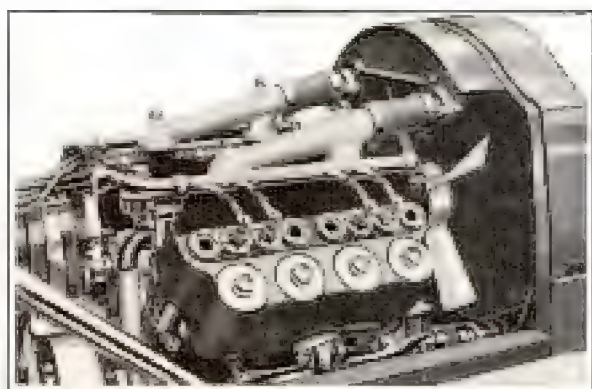
A Characteristic Example of the Use of Silent Chains to Drive Automobile-Engine Camshafts, Magnetos, etc.



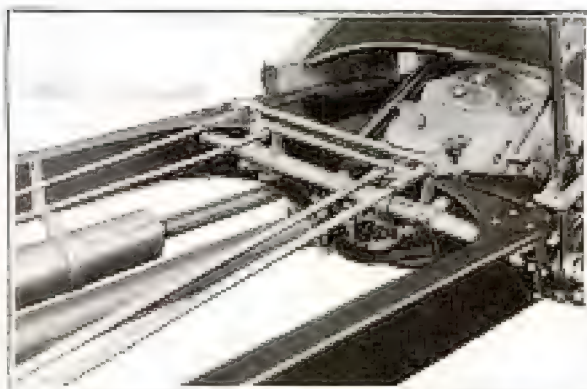
The New Darracq Rotary-Valve Motor



Three Stages in the Operation of the New Rotary-Valve Motor, Showing Different Positions of Valve



A New 8-Cylinder, V-Shaped Automobile Engine Exhibited at the Show, Which Received High Praise from Engineers



A Recent European Chassis, Showing the Neat and Simple Arrangement of the Various Mechanical Elements, and the Steel Tapes for Brake Actuation

with, in which the intake and exhaust of the four-cylinder motor shown are simply controlled by a single rotating valve, internally "water jacketed" and driven by two pairs of bevel gears.

In the motors in which pop-pet valves are retained, it is becoming almost universal practice to encase the valve mechanisms completely with readily removable cover plates, thus improving cleanliness as well as

silence. Another notable development is the fast-increasing use of silent chains in the place of spur gears for cam-shaft and magneto drive, etc. In one instance, the silent chain is even introduced

into the change gear, apparently with unqualified success. Its advantage is a silence that in addition to continuing is greater than in even new spur gears, unless cut and hardened much more perfectly than



A Coupe Body Shown at the Recent English Automobile Show



A Car Designed Especially for the Durbar Ceremonies in India—It has a 14-Ft. Wheelbase and Seats 10 Comfortably

present processes ordinarily make possible.

Silence in the final drive is commencing to be sought in the use of worm-and-worm-wheel combinations in place of the more common bevel-pinion-and-gear system. While anything but a perfectly cut worm is inferior in durability to bevel gears, its silence is absolute. The qualities of the worm gears applied in several beautiful chassis on view at the show left nothing to be desired.

The tendency to decreasing bores with lengthening strokes still persists; but by many is ascribed to a desire to evade European taxation fees which have been based upon bore diameter, rather than upon any engineering motive. However, the advantages of the "long-stroke" are most definite in their application to motors of small size and high-efficiency, toward the exclusive production of which most manufacturers are tending, rather than in the enormous and clumsy constructions that are a passing feature in automobile design.

In the chassis of the most perfect of the modern cars an altogether unprecedented refinement of lines and details is becoming manifest. A seemingly small, but nevertheless characteristic example is found in the flat steel tapes, shown in the accompanying illustration, for the operation of the brakes.

Another brake novelty that has come into use on several worm-driven Euro-

pean cars is the placing of the foot-operated brake on the back of the differential casing, where it possesses the advantage of working with the leverage advantage of the propeller-shaft speed, while it is at the same time readily accessible.

The constantly increasing use of wire wheels, capable of almost instant detachment from the axle and replacement with an extra carried on the car, is a solution of the tire and other problems that so far, for some unexplained reason, has not commended itself to American manufacturers. Elaborate tests have proved wire wheels to be stronger and more elastic than wooden wheels, and to reduce tire wear (in the service of London taxicab companies) about 50 per cent. In addition to this, there is avoided the objectionable fly-wheel effect of the great mass of demountable and other wood-wheel rims. And the growing rarity and cost of good hickory is another point in favor of the comparatively cheap wire wheel.

The production of well-designed and high-grade body work is another detail in which the European manufacturer stands second to none. Most worthy of mention among the beautiful examples seen at the show were the inside-driven "saloon-limousines," the coupes, the commodious and long-wheelbase designs popular among the native princes of India, and such novelties as the tiny "conning-tower" top for torpedo runabouts.

WOMAN JURORS VEXED WITH STRANGE PROBLEMS

The country at large is wondering whether or not it was with a motive that the court officials in California brought a man charged with saying mean things about a neighbor before the first woman's jury to be organized in the state after the passage of the suffrage law. Of course the man wasn't really charged with being a gossip, nor did the information filed with the court state that he gossiped. He was the editor of a newspaper and

he was accused of printing improper statements regarding a member of the council of the town of Watts. Whether there was any snickering among the court attachés on account of the gossip charge or not, it did not last long, as the ladies handled their case with ease, acquitting the prisoner on the second ballot, the jury standing 10 for acquittal on the first ballot.

The trial judge at Watts was spared the problem that came before a judge

in Los Angeles when the first jury of women was summoned in that city. The case in this instance involved a youth accused of speeding a motorcycle. The trial dragged out a fairly long time and when the jury came to make up its mind what to do with the prisoner there was an assortment of opinion that wouldn't co-ordinate in a verdict. Lunch time came with the problem still unsolved, and the case was forgotten in an effort to settle the matter of how the jury was to be fed. It so happened that several of the ladies had left their purses at home, and, not understanding that the county was responsible for their food and lodging while engaged in the consideration of the county's business, there was a wide difference of opinion as to where the jury should lunch.

The twelve ladies had almost as many favorite luncheon places selected and at least one of them is reported to have felt rather nervous because she was not at home to get her husband his midday meal. The ladies who had no money were not really hungry and said so. What bade fair to be a lasting controversy was ended by the whispered information from a bailiff that the county was host for the occasion. And the prisoner? Well, the jury couldn't reach any conclusion about him and he was discharged after five ballots had been taken.

PROPOSED REMARKABLE TOWING FEAT

Preparations for a remarkable piece of towing are described in the Shipping Gazette, London. A large dock is being built near Amsterdam for the Dutch East Indies, and it happens that a smaller dock and a ship are being built in England for the same destination. To save three separate towages, it is proposed to put the ship in the small dock and to put the two in the large dock, which will be brought to England for the purpose. The unique three-decker will then be towed to the East Indies.

The First Women's Jury Called in California



PROGRESS OF THE MONTH IN AVIATION

The development of aviation in connection with the navy has reached such a stage that news dispatches quote officers of the United States



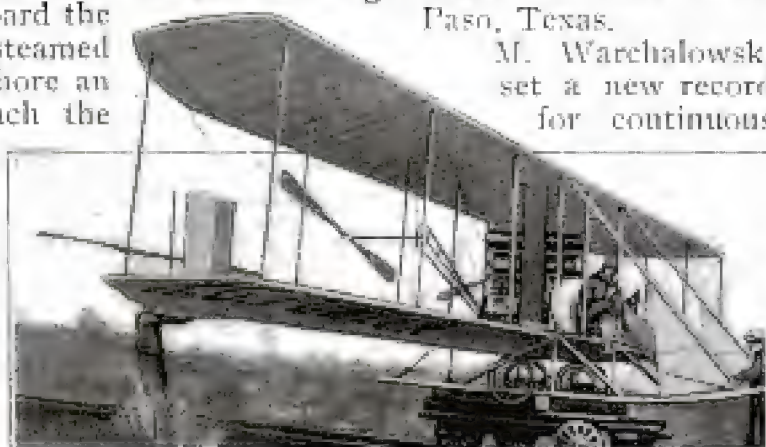
The Mishap Caused by Attempt to Launch Aero-Hydroplane from Moving Ship

warships as predicting the equipment in the near future of each battleship with at least one aeroplane. Following the successful experiments in October with the Curtiss machine by officers of the Annapolis airmen's school, a series of tests of a Burgess-Wright aero-hydroplane was conducted in conjunction with the Atlantic-fleet maneuvers. Lieutenant Rogers made a long flight over the battleship fleet off Newport, R. I., flying at the rate of 50 miles an hour, swooping down to the surface of the water and flying aloft again. On the completion of this maneuver, the machine was hoisted aboard the battleship "Ohio" which steamed out to sea. Ten miles off shore an attempt was made to launch the machine. The forward movement of the vessel tilted the biplane at such an angle that one wing and the rudder dipped into the water, causing a strain that resulted in the snapping of the rudder and wing supports, thus bringing the experiments to an end.

Calbraith P. Rodgers finished his trans-continental flight from Sheepshead Bay, N. Y., when he arrived in Pasadena, Cal., Nov. 5, completing what is generally credited with being the greatest achievement, thus far, in aerial navigation. His attempts to fly the remaining 20 miles that intervened between Pasadena and the Pacific Ocean have not yet been successful, but his achievement is regarded as complete as it now rests. He flew a total distance of 4,231 miles, at an average rate of 51.7 miles an hour in 49 days, or 82 hr. 4 min. by actual flying time, making 29 stops en route in 11 states.

Robert G. Fowler, who started from the Pacific for the Atlantic, had a chapter of accidents in Arizona, New Mexico, and Texas, and spent Thanksgiving Day in Fort Worth, Texas, awaiting repairs to his aeroplane from damage caused by collision with a mad bull in a field near Fort Worth. He left Los Angeles Oct. 18. While in New Mexico his machine was stalled in the desert, the heavy sand holding it firmly when the motor was started so that launching from the ground was impossible. Recourse was had to the railroad tracks and the machine was set up on a handcar. When the motor was started the car was sped along the track at a fast rate of speed for a short distance, and then the machine rose in the air without difficulty and the flight was continued to El Paso, Texas.

M. Warchalowski set a new record for continuous



Unable to Make a Start in the Desert Sand, Fowler Utilized a Handcar for the Purpose

flight with three passengers at Vienna, Oct. 31, by remaining in the air 45 min. The previous record was 31 min. 23 sec.

The French airmen, Legagneux and Martinet, found a new field for the aeroplane when they used it as an aid to hunting birds and rabbits in the neighborhood of Compiègne, France, early in November. Their bag for a day's hunting included several brace of birds and a pair of hares.

Four deaths were caused by aeroplane accidents during the month of November. Herr Schinrunek, a Bohe-

mian airman, fell from an altitude of about 800 ft. at Pilsen, Bohemia, Nov. 2, and was killed. On Nov. 15, Herr Pletschker fell while flying over the aviation field at Berlin, Germany, and was killed, and on Nov. 25, Lieut. Baron Freytag von Loringhoven, of the German army, was killed by a fall in Berlin. Herr Mosca, a distinguished Austrian writer, fell from a machine in which he was a passenger, at Wiener-Neustadt, Nov. 30, and was instantly killed. The pilot of the machine was unhurt and the machine descended undamaged.

"MAINE" WAS WRECKED BY OUTSIDE EXPLOSION

The board of officers of the army and navy appointed to make the final inspection of the hull of the battleship "Maine" in Havana Harbor, have completed their work and are quoted as being convinced that the explosion which sank the ship originated outside the hull and was probably caused by a submarine mine. The board's conclusion has been reached after a careful investigation which necessitated a minute inspection of the wreck as it lay exposed in the huge coffer dam built around it. The board has not yet presented its report to the Secretary of the Navy. A piece of metal which could not be identified as a part of the ship fittings, and is believed to be part of a mine, is said to have been discovered near the wreck, and the board is endeavoring to identify it before proceeding with its report. The plates in the forward part of the ship were found bulging inward and a part of the keel was discovered to have been blown upward, a condition which could have been caused only by an exterior explosion. It is presumed that after the report of the board has been presented, the

will be cut into small pieces and taken out to sea and sunk. The matter of using a part of the wreck for the man-



Wreck of the Battleship "Maine" as It Appeared Recently When Inspected by the Investigating Board of Army and Navy Officers

It is manufacture of souvenirs for the public has not yet been decided by the authorities.

QUAINT EUROPEAN DOLL

The latest toy creation in Europe to challenge the popularity of the "Teddy Bear" is a doll, now very popu-



The Quaint Dolls which Seriously Challenge the Teddy Bear as the Special Favorite of English Children

lar in London. These quaint dolls, which go in pairs, have become nursery favorites all through England.

BRITISH SUBMARINE MISLAID

The British submarine "A.1," which was sunk in the Solent, the wide strait between the Isle of Wight and England, about seven years ago, with a loss of 11 lives, was sunk again recently, and thereby hangs a tale. A short time ago she was taken to the experimental grounds and sunk, the object being to carry out tests of a new apparatus for raising submarines. The next day, however, when the torpedo boats were sent to carry out the first stage of the operations, she could not be located, and for the next three weeks continued attempts were made to find her, but without avail. It is believed that she was swept away some distance by the strong currents of the channel.

It has been calculated that nearly 300,000,000 ft., or over 55,000 miles of film are used up yearly, to satisfy the world's demand for moving pictures.

FIRST PHOTOGRAPHS OF THE MORMON TEMPLE

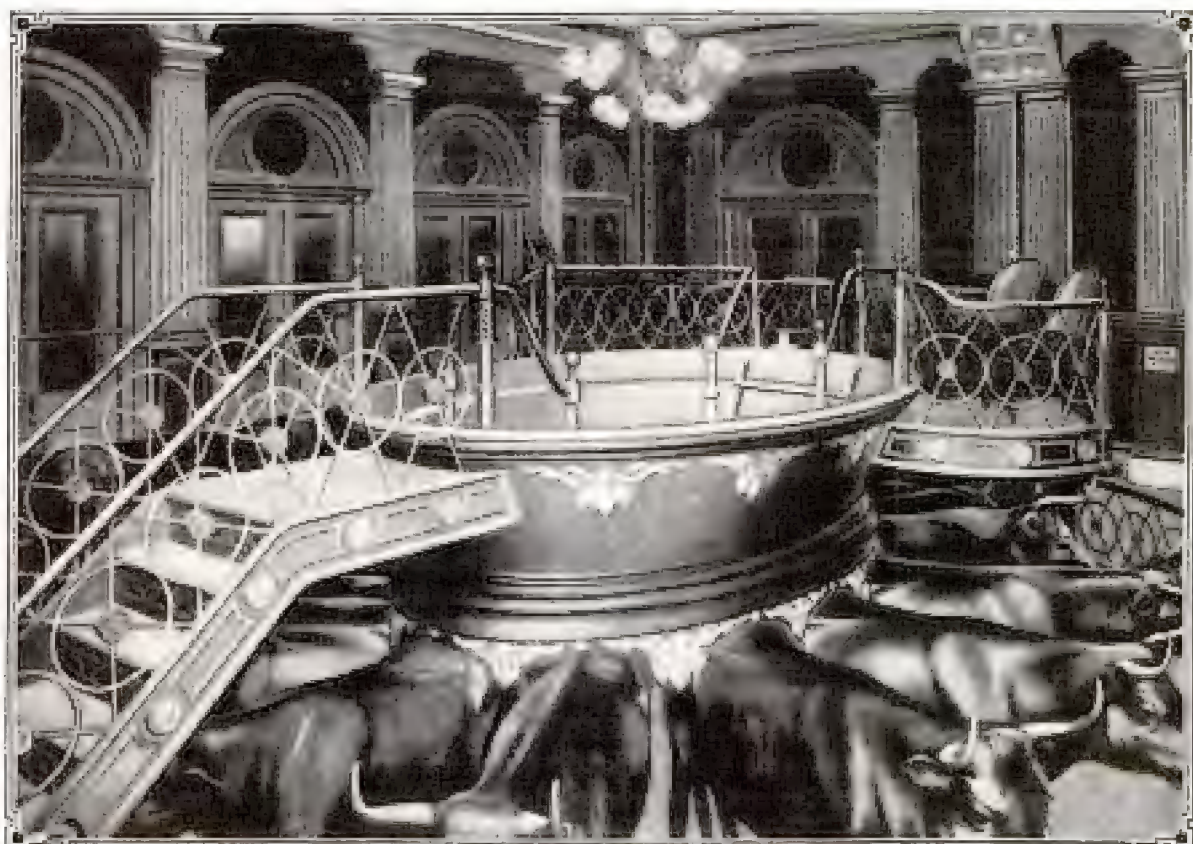


A Statuary Group

The photographs reproduced herewith are the first pictures of the remarkable, and heretofore mysterious, \$4,000,000 temple of the Mormons at Salt Lake City, ever given out by the officers of the Church of Jesus Christ of Latter Day Saints, as it is officially called. They reveal an edifice of great architectural beauty and elaborateness. The imposing baptismal font is built of cast iron and rests upon the backs of 12 life-size, cast-iron, bronzed oxen. Figures of Prophet Joseph Smith and his brother Hiram may be seen in the photograph of the statuary group, on either side of the column, surmounted by symbolical figures.



A Staircase in Main Assembly Room



The Beautiful Baptismal Font, One of the Most Elaborate in the World

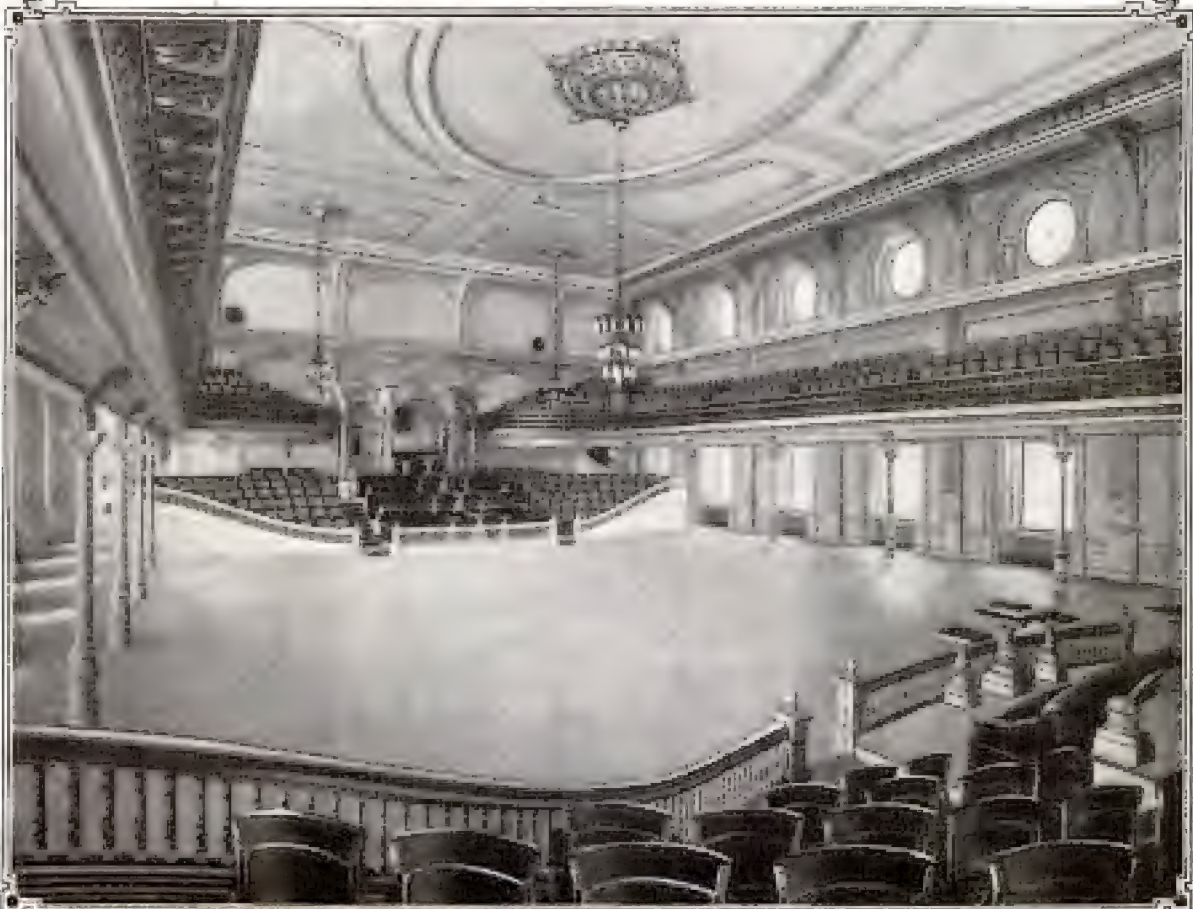


Photo Copyright, 1911, by Joseph F. Smith, Trustee for Church of Jesus Christ of Latter Day Saints

View of Main Assembly Room of the Famous Mormon Tabernacle at Salt Lake City

COMMENT AND REVIEW

**Decline
of the
Muckraker**

WITH one magazine sold under the hammer for \$10,000, which is understood to have received \$1,000,000 from sale of stock to its readers; and three officials of another publication out on bail after indictment charging them with fraudulent sale of stock; and yet another magazine withholding the payment of a dividend which had been declared, but which apparently had not been earned—the honest magazine publisher is forced to blush for the doings of some of his fellows. Stock in several magazines has been unloaded on the public under conditions compared to which salting a mine would seem an act of righteousness.

Perhaps there is something contagious in muckraking which dulls the moral perception. Muckraking articles, possibly sincere at the start, long since degenerated into mere sensationalism to sell copies; and instead of being the great reformers they so loudly boast, many publishers are merely mercenary. Any man or act, however good, can be presented under conditions fit only to condemn. A scratch on a silver spoon does not make the spoon pewter; even a man with only one eye is not blind. It is a low standard of publishing that caters to a depraved public taste which prefers the slime which drips from even the purest ice. Editing is understood to be the art of sensing what the people want—and giving it to them; but this does not excuse a pandering to an unwholesome mental appetite any more than it defends a doctor who would run an opium den.

Dishonest methods may prosper for a time, but sooner or later there comes the inevitable day of reckoning.

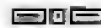


**The Canal
and the
Navy**

ON the last day of October there passed in review the 102 vessels of the Atlantic fleet at New York, and the 24 vessels comprising the Pacific fleet, at San Pedro: an aggregate displacement of 673,000 tons of fighting ships and their floating auxiliaries. Of first-class battleships we now have 35 afloat or under construction. These ships alone cost approximately \$200,000,000.

The Panama Canal will cost about \$400,000,000, but in this connection it is stated that the canal will practically double the efficiency of the Navy. While this is a general statement, which under special conditions might not hold good in all respects, it is not unreasonable to assume that the canal will give us a new asset in our Navy amounting to a sum nearly, if not entirely, equal to the cost of the canal. In other words, while the canal does tie up millions long in advance of their expenditure for ships in the ordinary course of the nation's growth, nevertheless the asset is there. Moreover, the interest and operating expenses on, say, \$10,000,000 invested in the canal, which gives us the equivalent of one new battleship, does not begin to equal the interest and operating expenses on \$10,000,000 spent on a battleship. The two items of

fuel and payroll alone will emphasize this. Of course, the canal does not make battleships unnecessary: in fact, it will doubtless necessitate additional ones, but this will be on account of greatly increased and expanded trade by sea, and there must be adequate naval power to protect this trade.



ENGLAND'S great motor event of the year, the Olympic Show, proved the same success that marked its predecessors and indicates an unabated interest in motoring. An expert who has followed the progress of the motor

*Speed
no
Inducement*

car very closely, after studying the show this year, says that the thing which most impressed him was the absence of any demand on the part of the public for speed as a desired quality in a car. They wanted sufficient power, of course, to get over hills at a comfortable rate of going, but they looked for more quiet-running engines and machinery, comfortable and roomy seats, easy-riding springs, and most of all economy of operation. The excessive cost of gasoline abroad, particularly on the Continent, makes this feature a serious consideration. Seventy-five cents and up per gallon will not deter the wealthy American who has shipped his car across from piling up as many thousand miles as possible, but the Englishman, more prudent and calculating, counts the cost. The essential point, however, is the utter lack of interest on the part of buyers in excessive speeds, confirming the recent article in this magazine on the fallacy of motor races as a selling feature. The editor of *The Car* (London) says: "Trials resulting in a record for reliability and economy are of value; but records of mere speed . . . are valueless from a commercial point of view."



THIS is certainly the day of the internal-combustion—or, as commonly known, the gas engine. From a crude, heavy, unsightly and highly unreliable machine of only a few years ago, it has developed into such efficiency and dependability that yachts so equipped are sent on ocean voyages of hundreds of miles and fire engines are propelled and pumped with them. While the steam engine has long ceased to show improvement, the gas engine has steadily forced its way into all manner of uses where steam would be quite impracticable. Having thus attained a high degree of perfection in small units—small compared with

*After the
Gas Engine:
What?*

large steam units—the next advance will be the gas engine of large power. Already experiments are under way in Germany, looking to the construction of a big 6-cylinder gas engine which shall produce 16,000 horsepower. A Swiss firm hopes to perfect a gas-engine locomotive which would do away with all smoke and cinders.

These large units naturally would use producer gas in place of gasoline, but the question logically suggests itself, where will the world's supply of gasoline come from, and what will be its price in a few years, if the gasoline-consuming engines continue to increase as they have done in the past ten years? Will the gas engines of the near future be run on kerosene, or will the gas engine have its day of prosperity and be dethroned in turn by something else? The present storage battery will never displace, as it cannot

replace the gas engine, but is it too far beyond the possibilities to anticipate a time when the millions of horsepower now going to waste every day on the tropical deserts of the world shall be imprisoned and converted into some highly condensed solid, which can be cheaply transported. To invent an engine which would utilize this condensed heat and power would surely be a not difficult accomplishment. Already we have gasoline and alcohol in solid form, convertible into gas for use on motor cars, and while neither fuel at the present time finds any large market in the solid form, the demonstration is not without its valuable suggestions.



HOW many of us realize we are daily observers of history making; that the transition from horses to motors is actually and rapidly taking place, not only in our big cities, but everywhere. The change is, of course, a gradual one. A horse drops out here and a team there, and no one gives it a thought; but if the horses which have been taken off the streets of any large city had been removed in a single day, what a lot of talk it would make. It is the gradual change, like spring merging into summer, which causes us to fail to notice. However, there occasionally appears a real milestone on the course, such as happened in London the

*"Horses
not
Allowed"*

last day of October, when a big motor company took over the horse-omnibus company, the exit of the last horse bus being duly photographed and recorded for historical purposes. The hansom cab, ever a most unstable vehicle, is likewise literally on its last wheels, and a few months hence will know it no more.

In a very few years we will see signs on prominent streets throughout all our cities, "Horses not allowed on this street," and the motor may then be said to have fully come into its own.

Nor is this condition confined to the city. The country roads for 20 miles out of London, in all directions, formerly were crowded with truck farmers driving their one-horse carts daily to and from the town markets. Now the horses are so few that scores of resting places where refreshments were sold for man and beast, have been obliged to go out of business. In Europe, where the street car has never been any too popular, they are already anticipating the time when that means of transportation will be forced from the streets into subways.

H. H. WINDSOR



Mules Being Given a "Joy Ride" as a Means of Advertising Motor Trucks

MULES GIVEN "JOY RIDE" AS MOTOR ADVERTISING

On receiving a consignment of motor trucks recently, a "live" automobile dealer in Dallas, Texas, where horses and mules are so thick that trucks of this kind are still somewhat of a curiosity, organized a "joy ride" for mules as an advertising feature. Banners bearing the inscription "Emancipation Day—Our First Joy Ride" were attached to the sides of one of the trucks and five Texas mules were driven aboard. A band was loaded into another motor truck, and the business section of Dallas was paraded.

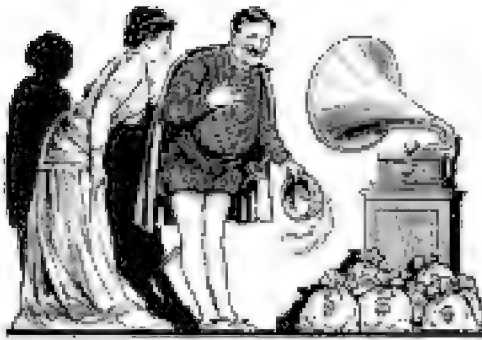
So anxious is the government of Brazil to secure immigrants that agriculturists entering the country from abroad are given free passage from port of embarkation in Europe or America, hotel accommodation on arriving in Brazil, transportation to the section of the country where they desire to settle, long credit in the purchase of farming land and gratuitous supplies of seeds, vehicles and implements with which to till the soil.

INGENIOUS ADVERTISING IN FRANCE

This remarkable "underwear" advertisement now appearing in the prominent magazines of France shows the ingenuity of the French in creating publicity ideas. The illustration is made up like an X-ray photograph, and each member of the passing throng is shown to be wearing a certain brand of underwear.



Illustration for a French Underwear Advertisement



Science and Mechanics

VERSUS

The Player and Musician

By ROBERT GRAU

"An upheaval is on the horizon such as will change the musical and theatrical map, unless the impetus of science and artifice on our realm is retarded."

Thus spoke a distinguished musician to the writer on New York's musical "Rialto" a few weeks ago. The expression, perhaps in a less prophetic view, is one to be heard frequently today.

There has been much encroachment on the artist's realm through the advent of such inventions as the motion picture, the phonograph, the player piano, and the automatic orchestras.

Rather than that we are to witness an upheaval, it is believed that players and singers will affiliate with the scientific inventors, for already many are bowing to conditions and also profiting hugely as a result.

If Caruso, the great tenor, happens to lose his voice or become incapacitated because of such illness as has kept him off the operatic stage the last half of two seasons, he will feel consoled by the knowledge that his royalties from a phonograph company will exceed \$100,000 a year for many years to come; while Madame Tetrassini is grateful that the same company refused to pay her \$1,000 five years ago for the very same effort that they are now paying her \$35,000 a year for. Then the diva was willing to take the lower figure outright for her records, but a year ago she demanded a bonus of \$25,000 besides the royalties, and she got it.

Our pessimistic musician, whose prophecy is recorded at the outset of this article, need hardly fear for the welfare of the celebrities. Only a few years ago they would all have felt insulted at the very suggestion of their

singing for a phonograph company, but the reports of Caruso's earnings in due course reached Mary Garden, Geraldine Farrar, and Emma Eames, and now we find the spectacle of these three prima donnas reaching our shores one month ahead of the date for their engagements, and proceeding directly to the vocal studio of a phonograph company.

Now Kubelik succumbs to a \$50,000 temptation to have his artistry on the violin perpetuated, and it is on the cards that Paderewski, the Titian-haired pianist, has demanded \$250,000 in order that posterity may hear his piano playing.

Dramatic stars are no less cognizant of the gold-laden opportunities science has placed before them. The great Réjane and Coquelin, as well as Jane Hading, the three greatest players on the Parisian stage outside of Bernhardt, have been induced to pose before the camera for moving pictures, and without the least flutter, even the divine Sarah herself has positively contracted with an English company for a condensation of "Camille" to be presented in two picture reels. "I am playing for posterity," says Sarah, "and who shall say me nay? What would we not all give, if we could see the art of the great Rachel, of Garrick or of Kean! I am glad that I can leave my art behind me, for even the greatest of players are forgotten in this age of wonders."

¶The use of a trade mark or symbol that will identify all goods made in the British empire is being agitated by the merchants and manufacturers of the United Kingdom; the idea being to utilize the same mark for all classes of goods.

NEW METHOD OF COMMERCIAL STERILIZATION

It has been known for some time that the light of the mercury-vapor lamp was especially rich in actinic rays. These are for the most part invisible to the eye and have the greatest chemical activity. It is for this reason that photographs can so readily be taken by these ultraviolet rays, as the invisible portion of them is frequently called.

But as they have an extremely short wave length—approximately 0.00001 in.—they are practically cut off by an interposed wall of ordinary glass. On the other hand, they will pass freely through the common mineral quartz, due to molecular differences between this material and glass, and when, in recent years, a way was found to fuse and manipulate quartz in much the same manner as glass, quartz tubes were made for use with the mercury-vapor lamps, and it was discovered that the ultraviolet rays which quartz permitted to escape, possessed, beside their highly actinic property, remarkable sterilizing power. This power they retain at a distance of one or two feet, but are quite readily absorbed by the air.

Practically all recognized species of harmful bacteria are destroyed by a few seconds' exposure to these rays, and the action seems to be independent of the temperature of the solutions acted upon. The apparatus is as simple as the process, merely a standard mercury lamp and any ordinary commercial continuous-current attachment.

Sanitary engineers are very favorably impressed by what has been done, and believe the process offers great possibilities.

¶In Holland there are two kinds of establishments from which medicine can be purchased, the drug stores, where only prepared drugs are sold, and the apothecaries, where prescriptions from physicians are compounded,

ONE USE FOR THE RADIO OR WIRELESS COMPASS

The manner in which the "wireless" or radio-compass, invented by two Italian naval officers, is utilized by the



The Radio Compass Enables a Ship to Locate, in Fog, the Positions of Lighthouses Which are Equipped with Wireless

officers of a ship befogged at sea to determine the bearings, is shown in the accompanying illustration. The purpose of the wireless compass is to point out the exact direction from which wireless impulses are being received, and, if the impulses from each lighthouse are tuned to a distinctive frequency, so that it will be impossible to mistake one for the other, it becomes a simple matter, through knowing the exact direction from which the signals proceed, to determine the position of the ship. The "wireless" compass, once its frequency is tuned to a given pitch, indicates automatically, by means of a pointer, in what direction the signaling station lies.

AN INCIDENT OF THE AUSTIN FLOOD

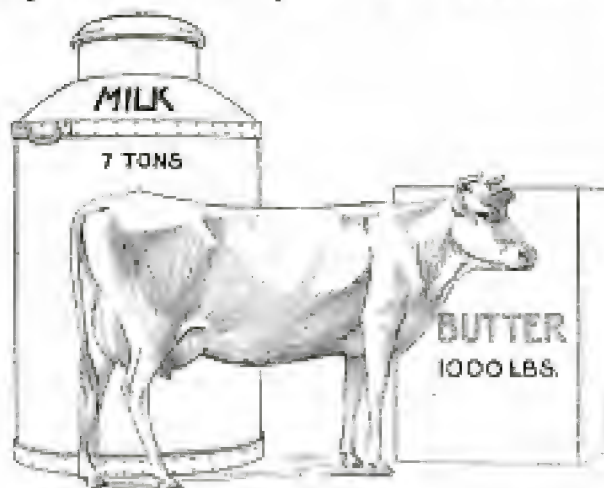
Although the church of St. Augustine was completely wrecked in the Austin flood, the statue of the Savior



Statue of the Savior Unharmed in the Austin Flood was found absolutely unharmed and standing in its usual position. The illustration shows the statue being removed from the wreckage.

COW STATISTICS

There are 22,000,000 cows in this country, and the Department of Agriculture estimates the wealth produced by them in one year to be \$800,000,-



This Champion Jersey has Yielded Approximately Seven Tons of Milk, Equaling 1,000 Lb. of Butter, in 12 Months

000, or an average profit of \$36.36 per cow per annum. Compared with this average per cow, the accompanying

illustration, showing what one champion cow produces each year, is interesting. This cow is "Sophie," a champion Jersey owned at Lowell, Mass. Her record for 12 months is 14,373 lb. 3 oz. of milk, equaling 1,005 lb. 11 oz. of butter.

CREOSOTING WOOD UNDER AIR PRESSURE

A new process of creosoting wood, claimed to be a great improvement over old methods, is now being tested. At a recent demonstration, various shapes and kinds of wood were weighed and measured and then sealed up in a cylinder, where they were subjected to an air pressure of 50 lb. per square inch. The cylinder was filled with creosote, the air pressure still being maintained, and then the pressure was raised to 80 lb. per square inch, after which the pressure was released and the cylinder opened.

The timber was then taken out and re-weighed, and various pieces were crosscut, all showing a remarkable penetration of oil, nearly to the center, which, it is claimed, is impossible in the old method except at great cost. One feature claimed for this process is the cleanliness of the wood, it being quite dry and clean to handle. It is likewise claimed that the cost of creosoting is much reduced by this method, a waste of the preserving liquid being entirely avoided.

THE TRANSPORTER BRIDGE ACROSS THE TEES

The new aerial ferry or transporter bridge across the River Tees at Middlesbrough, Eng., was opened recently by Prince Arthur of Connaught. This structure, which is the third of its kind in England, has a length of 850 ft. and an extreme height of 225 ft. The traveling car suspended from the structure will accommodate 500 passengers and six vehicles. In the illustration, which shows the opening ceremony, the car is seen in position to receive a load.



Officially Placing the Aerial Ferry or Transporter Bridge of the River Tees, Middlesbrough, England,
In Commission

SUITCASE AS DARKROOM FOR TRAVELERS

A quite ingenious adaptation of an ordinary suitcase for service as a photographic darkroom, especially for



Suitcase Equipped as a Darkroom

travel in the tropics, was used by H. W. Smith, of the Massachusetts Institute of Technology, on a visit to Tahiti, and is described by him in the National Geographic Magazine as follows:

The right half is occupied by a water-tight rubber bag, supported on three sides by the sides of the suitcase and on the fourth by a brass rod, which may be seen extending over the edge of the case and hooked into the lock. The developing tank, filled with developer at a temperature sufficiently below the normal to allow for rise of temperature before development begins, rests in this rubber bag, as



The "Darkroom" in Use

shown. The object of the rubber bag is to prevent damage to plate holders that are placed in the other half of the suitcase in the event of the tank spilling over.

The cover of the suitcase is held up by means of a light wooden rod at each corner, and a dark bag, made of a double-fabric gossamer with the seams vulcanized, is then placed over the whole.

The other illustration shows how two long sleeves permit the operator to transfer the plates from the holders to the tank without the necessity of himself being in the confinement of a darkroom, a distinct convenience in the tropics even on the rare occasions when a darkroom is available.

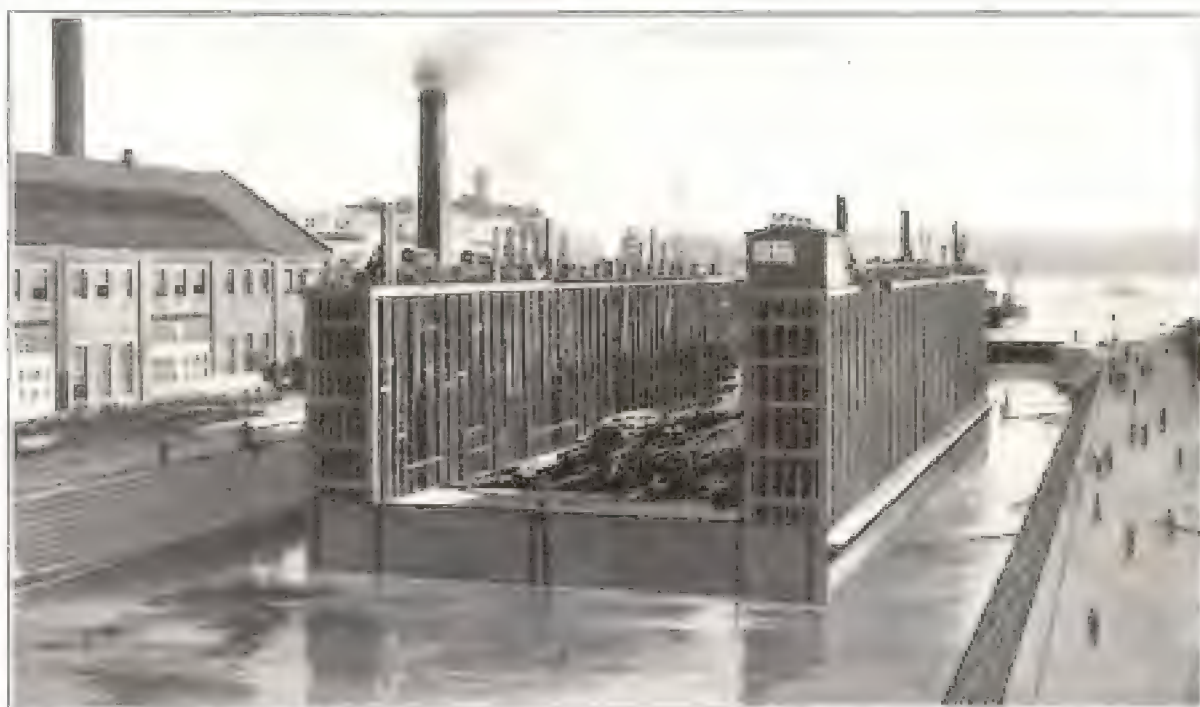
REINFORCED CONCRETE USED IN OLDEN TIMES

Although concrete has been used for many centuries, it is usually understood that reinforced concrete is a modern invention. This, however, has been disproved by the finding of bronze reinforcing rods in the concrete roof of an ancient Roman tomb, and in the discovery of reinforced concrete in the construction of one of the walls of the old palace of the Louvre, Paris. The reinforced concrete in the latter dates back only 300 or 400 years, but created much comment because the walls were thought to consist entirely of ashlar and quarry stone. The discovery that the stone casing concealed a core composed in part of reinforced concrete was made while workmen were piercing the wall for an elevator installation.

A DRYDOCK WITHIN A DRYDOCK

The unusual sight of a drydock within a drydock was presented at the Puget Sound navy yard a few days ago. In the accompanying photograph is shown the dock of a private concern, as it appeared just after entering the Navy Department's big graving dock for cleaning and overhauling.

This dock, which is built of wood, had been continuously in the water for about eight years, and the owners



A Floating Drydock within a Drydock

decided it time to repair and overhaul it. There was no other way of getting the dock out of water, so permission of the Navy Department was secured and the dock towed to the navy yard by tugs, a distance of 16 miles.

There was ample room for the smaller dock in the larger one. The wooden floating dock has an extreme length of 200 ft., width of 40 ft., and capacity of 2,600 tons. The navy dock's length is 650 ft. over all, and 619 ft. on the floor. The width at entrance is 93 ft., and depth over sill, 38 ft. However, as the graving dock slopes toward the bottom, it was necessary to build a staging some 12 ft. in height on which to rest the wooden dock.

NEW FOURTEEN-CYLINDER AEROPLANE MOTOR

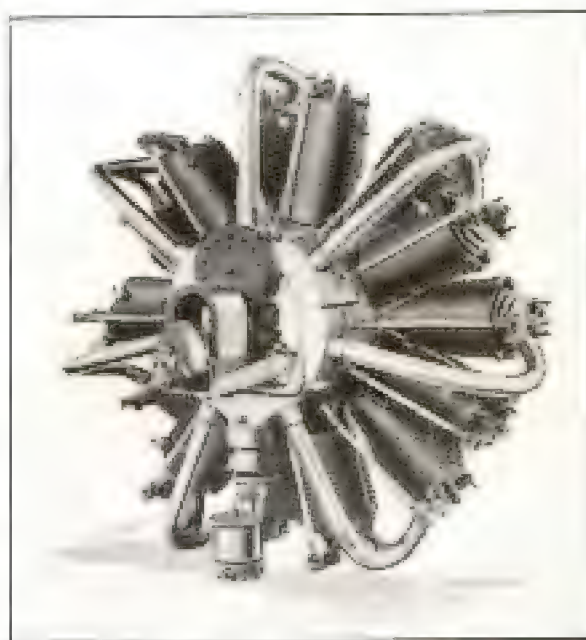
One of the newest of the French aeroplane motors is that illustrated herewith.

This motor, while in its general appearance simulating the well-known French revolving motors, is not designed to revolve, the two series of seven pistons being each linked to the throws, 180 deg. apart, on a two-throw

revolving crankshaft which carries the propeller.

This engine is designed by Anzani, famous as the builder of the three-cylinder motor with which Blériot accomplished the first crossing of the English Channel.

By eliminating the revolving principle the objectionable gyroscopic effect is avoided, as well as the tendency of



A New French Aeroplane Motor Designed by Anzani

the cylinders to come off under the influence of the high centrifugal force. At the same time, the frequency of the impulses is sufficient to make of the propeller all the flywheel that is necessary.

The normal speed is from 1,000 to 1,200 revolutions a minute, and the ignition is by a single magneto, provided with a 14-point special distributor. Lubrication is by oil fed through the hollow crankshaft.

The cylinder bore is $3\frac{1}{2}$ in. and the stroke $5\frac{1}{10}$ in., with which dimensions 100 hp. is secured.

FISH STOP STEAMSHIP IN THE ATLANTIC

While in mid-ocean, on a recent trip from London to Halifax, the steamship "Durango" of the Furness line was brought to a stop by passing through a school of fish. The stop was due to the failure of the circulating pumps, and for a time the crew were unable to discover the cause. When the circulating feed pipe was examined, however, it was found to be filled with fish, which completely blocked the passage and prevented the pumps from working.

There are 260,000 miles of submarine telegraph cables in the world, of which more than 100,000 miles have been laid in the last ten years.

BOARD WHICH VIBRATES IN REMARKABLE MANNER

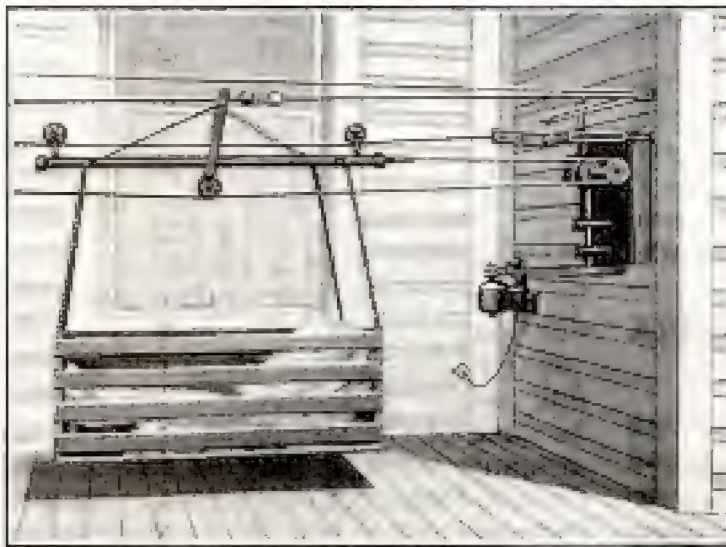
A remarkable case of continual movement, from no apparent cause, so pronounced that it is spoken of as "perpetual motion," has been a source of astonishment in Pacific Park at Long Beach, Cal., for more than a year.

In September, 1910, George W. Long, superintendent of the park, stretched a wire between two trees to keep people from walking over a certain plot of grass. Fearing that the wire was not sufficiently conspicuous, and that children might run into it and become hurt, he secured a board, 1 in. thick, 3 in. wide, and 16 ft. long, bored a hole 4 ft. from each end, and suspended it by means of two wires from the wire strung between the trees. A day or so later he noticed that the board was attracting a great deal of attention and discovered that it was oscillating vigorously, up and down. It has continued oscillating in this manner ever since, and, if stopped forcibly, immediately starts again on being released.

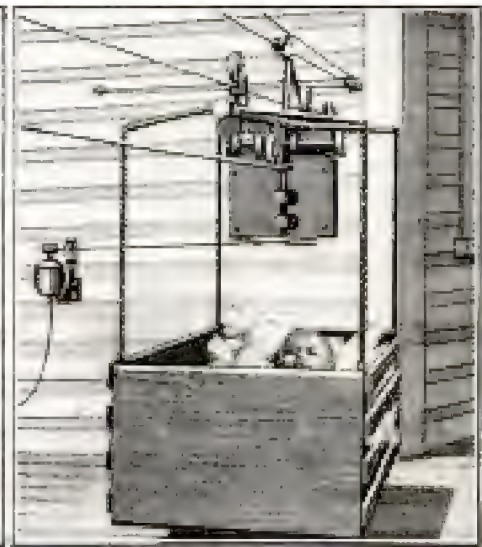
What makes the board go is a question still to be solved, although it is said many engineers and scientists have watched and tried to fathom the secret. The wind has nothing to do with it, because the less the breeze the stronger and more evenly it vibrates.



This Board Has Been Vibrating Vigorously for More Than a Year, Yet the Reason for Its Strange Behavior Has Not Been Found



Cableway Crib and Its Operating Mechanism



Engaging the Stop and Starting Back Again

BABY CRIB RUNS ON CABLEWAY

Running a baby's crib back and forth from end to end of a large porch on an electrically operated cableway, is a scheme designed by John G. Barnwell, superintendent of the municipal public-utility plants of Yorkville, S. C., to do away with the necessity of wheeling a carriage when the baby demands action.

The crib is hung from a suspension cable by means of wheels, as shown in the illustrations, the 30-ft. cable being stretched taut by means of a turnbuckle. An endless cable, connected by friction gearing to a small electric motor of the type used to run sewing machines, hauls the crib back and forth on the suspension cable. At each end of the line is a stop, which the crib engages on its arrival, thus causing the reversing gears of the driving mechanism to act and start the crib back again to the other end of the line, this action continuing as long as the motor is allowed to run. The motor is attached to an electric socket by a flexible connection in the usual way.

¶The high cost of food in France, particularly of fowl and eggs, is even being felt by the motorists, as the farmers now demand \$25 when a hen is run down.

WINTER SETS TRAPS FOR MOUNTAIN GAME

While it is generally known that the wild game of the Rocky Mountain region suffer the pangs of starvation during the course of a hard winter, it is not generally understood that other dangers beset them at the same time that seem, in effect at least, more cruel than the mere lack of food. In the Blue Cañon region of California, and perhaps in other sections of a similar nature, hundreds of deer perish during the winter when they are caught in



Deer Caught in a Snowdrift in the Blue Cañon Region of California, and Starved to Death

snowdrifts. A photograph was made of a handsome buck thus made prisoner, who died of starvation while held so securely he could hardly move. In many instances that have been noted by hunters and others, the imprisoned animals fall prey to other beasts more fortunate in avoiding nature's pitfalls.

HULL HAD BARNACLES SIX INCHES THICK

The fact that the southern waters of the United States, especially around Florida and the Gulf of Mexico, con-



Hull of Section Dredge Just Removed from the Water, Showing Thick Marine Growths

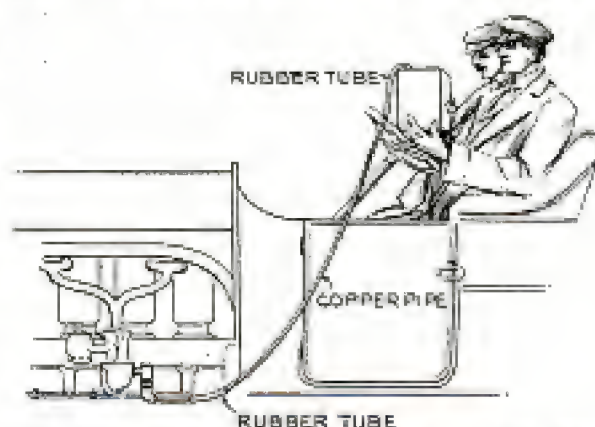
tain innumerable specimens of marine growth that attach themselves to vessels and seriously impede their speed or progress, is attested by the examination recently made of a suction dredge that had just been drawn out of the water at Tampa, Florida, to have its bottom cleaned. The hull was incrustated with marine growths to a thickness of 6 in. on some parts. Most of these consisted of a shellfish that is commonly called a barnacle. There are thousands of these attached to the bottom and each of them is said to contain a living creature. It is necessary to take vessels from the water and clean them by scraping every year or so. The dredge in this instance had been in the water three years. The growth of barnacles and marine plants has the effect of greatly decreasing the speed of the vessel through the water and of increasing its weight and displacement.

COMPRESSED OXYGEN FOR HIGH ALTITUDES

Several French physicians advise all airmen attempting altitude records to carry with them a supply of compressed oxygen and an inhalation mask. The cylinders should be provided with a simple regulator allowing about three, four or five quarts to flow out per minute. Distress on account of the rarefied air is not usually felt at altitudes under 13,000 ft., but because of the strenuous nature of an airman's work, it may be felt sooner. Several instances of distress at an altitude of but 11,000 ft. have been recorded in France.

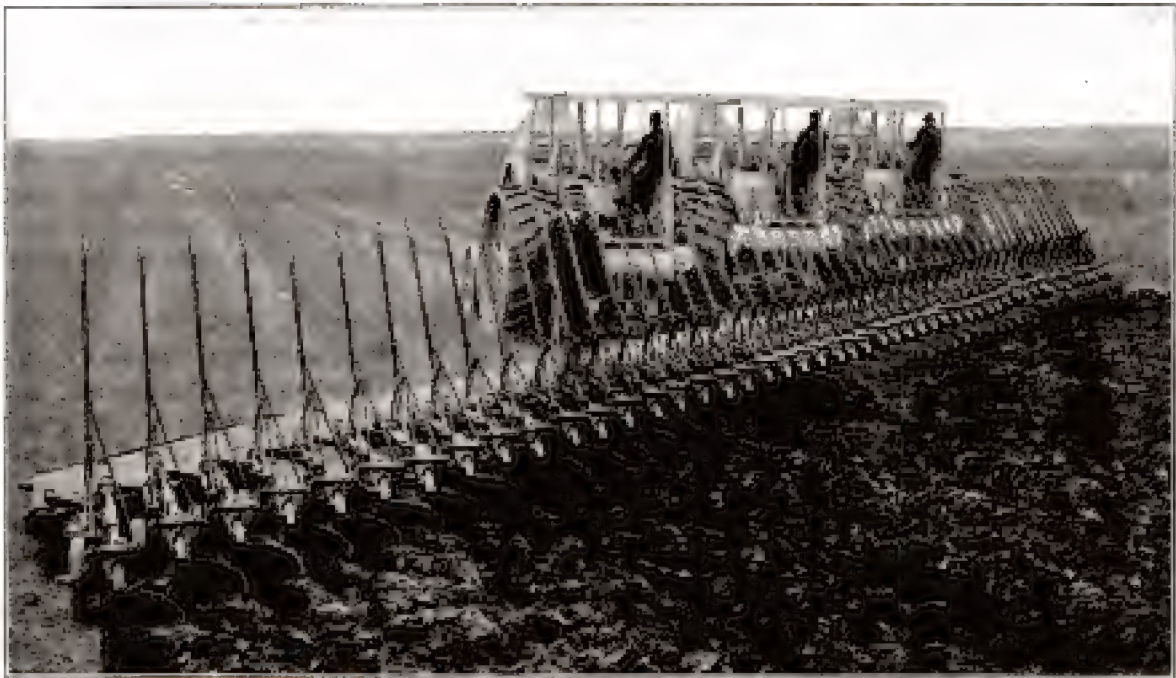
UNIQUE EMERGENCY GASOLINE FEED

The ingenious means adopted recently by a motorist to overcome troubles due to a faulty gasoline tank is shown in the accompanying drawing. While driving the car over bumpy roads, the pipe inside the gasoline tank became unsoldered, and this made the feeding of the carburetor from the tank impossible. Rather than have the car towed into the nearest town, or taking the gasoline tank off and starting out to find some repair shop, the owner of the car set his wits



A Case Where an Engine was Fed Out of the Tank to work and evolved the following system of feed:

The tank contained about 18 gal. of gasoline, and the idea carried out was the siphoning of a quantity of this



Fifty-Blade Gang Plow That Broke Up One Acre of Ground in Five Minutes

to a can, placing the can in the hands of one of the men in the machine, and then siphoning it to the carburetor. The rubber connection of the tire pump served for the first operation, and the copper pipe taken from the acetylene system, with a piece of rubber tubing attached to each end, served for the second. The siphon was started working by sucking on it with the mouth and then quickly connecting up the rubber tube to the feed pipe. The feed thus formed lasted for about an hour, just sufficient to reach home, the rubber being eaten away at the end of this time by the gasoline passing through it.

PLOWS ACRE IN LESS THAN FIVE MINUTES

The world's record for plowing was recently broken in a demonstration at Purdue University, Indiana, in which a gang plow having 50 plows and drawn by three traction engines turned over a stubble field at the rate of an acre every $4\frac{1}{4}$ minutes. This mammoth plow cuts a strip nearly 60 ft. wide, and turns over 7 acres for every mile it travels. Each of the 50 plows

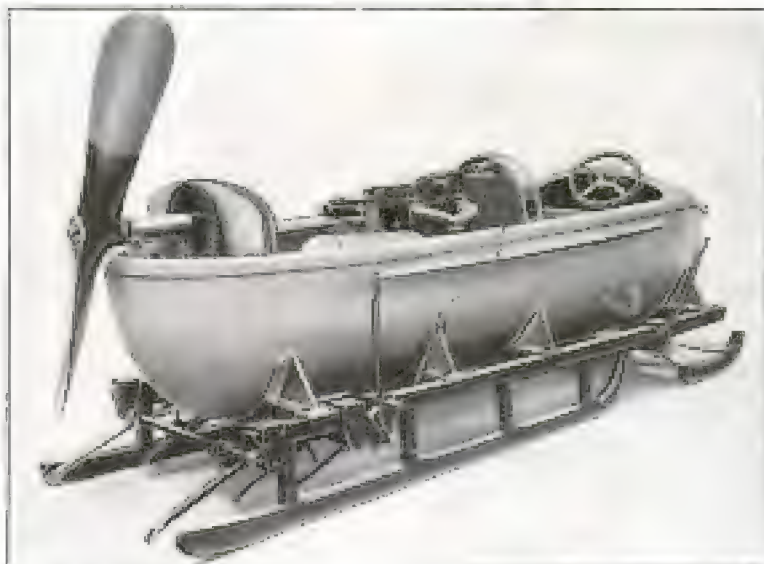
is independent of the others, rising and falling as easily and naturally as a wooden chip on the surface of rough water, so that the service of the machine is not confined to ground absolutely level.

What such a plow as the one shown can accomplish when started out on an open, fairly level prairie is remarkable. Allowing for no delays, it will turn over 7 acres for every mile traveled, 14 acres every hour, and, working 12 hours per day, six days per week, it will plow 1,000 acres. Working two shifts of men and plowing all night, as is now often done, the acreage turned over in a week would be just doubled. Fifty years ago a farmer with his team of oxen had to toil from dawn to sunset to break an acre of land, walking more than 10 miles to the acre.

¶The government of Peru is the first nation to take cognizance of the importance of aviation by making it part of a course in the public-school system, an order having recently been promulgated creating an aviation department in the school of arts and crafts at Lima.

MOTOR-SLEIGH THAT MAKES 60 MILES AN HOUR

A German motor-sleigh of unusual design, which travels at a speed of 60 miles an hour, was exhibited at the



German Automobile Sleigh with Tub-Like Body Makes 60 Miles an Hour in Tests

recent automobile show in Berlin. An automobile motor occupies the center of the body and drives an aerial propeller, mounted at the rear and connected to it by means of a combination of shaft and chain drives. The steel arms shown trailing under the rear of the body are the brakes. They are forced down upon the running surface, where they act as drags, by either of the two levers shown outside the body. The two levers are provided so that the brakes may be handled from the driver's or the mechanic's seat. Steering is accomplished by means of the light forward set of runners.

¶The completion of the Panama Canal will bring Yokohama, Japan, 2,000 miles nearer New York by water than the route through the Suez Canal, and Hongkong 350 miles nearer as compared to the same route.

¶In Saxony, the government confers a decoration in the form of a silver medal on workmen in private employ for long and faithful service.

TWO POWERFUL BATTLESHIPS FOR FRANCE

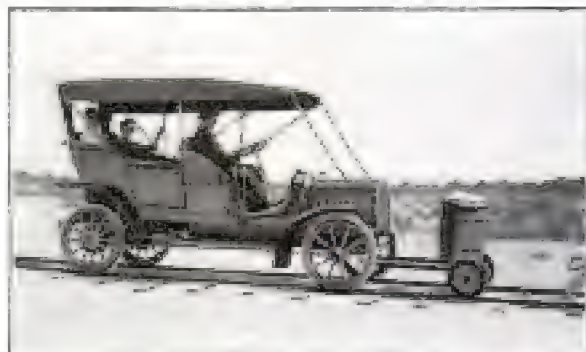
The two battleships "Jean Bart" and "Courbet," recently launched from the Brest and Lorient dockyards, are the most powerful ships ever constructed for the French navy. The length of these vessels is 541 ft.; the breadth, 88½ ft., and the displacement, 23,475 tons. The main armament consists of twelve 12-in. guns, arranged in pairs in six turrets, two forward and two aft on the center line, and two amidships, one on each side.

A feature of these ships is a third protective deck, this being the first time three have been employed. The third protective deck is a splinter deck, and is designed to counteract the

attack of aeroplanes.

AUTOMOBILE RAILWAY ON SANDY COAST

Wishing to develop a tract of land down the coast from Ocean View, Va., where the loose sand makes transportation by horse or automobile difficult, the owner constructed about three miles of track and uses his automobile upon it. Steel wheels take the place of the ordinary automobile wheels, and a light truck attached to the front of the machine serves for carrying supplies.



Automobile Adapted to Run on Track Carries Passengers and Supplies over Sand on Atlantic Coast

SOME RECENT AEROPLANE ODDITIES FROM FRANCE



STATUARY PROFILES FORMED BY AID OF MOVABLE RODS

A new apparatus, consisting of a set of parallel rods, invented by a sculptor of Berlin, allows the reproduction of



The Inventor Engaged in Modeling with the Aid of a Movable-Bar Pattern

the profiles of round sculptures and reliefs by a process almost entirely mechanical. It is an aid to sculptors in making clay models from living subjects, as it can be used to check the accuracy of the outline when the subject is not present, and also to carvers in reproducing the sculptor's clay models in marble.

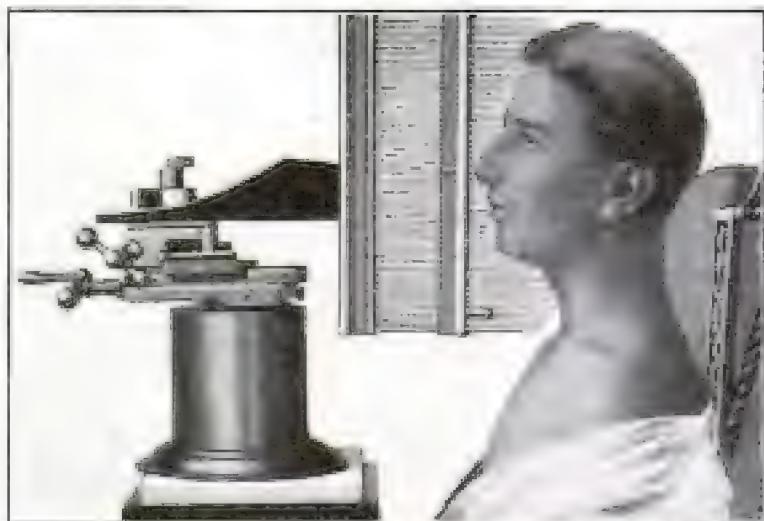
The apparatus may comprise one or several movable patterns, each consisting of a set of movable parallel rods displaced by their own weight or by a slight spring pressure. These parallel rods, when adjusted to a model, will arrange themselves along the profile of the latter, their ends touching all its depressions and elevations,

and are then made fast in the position they assume. The ends of the rods may then be made to give an imprint in sculptor's clay, wax or the like, and thus be a valuable help in reproducing the plastic forms of the model, its likeness being checked at will. Several such patterns arranged at variable angles can be used for reproducing the outline of the model in the corresponding planes.

COMBINATION FIRE ENGINE AND STREET CLEANER

The newest type of municipal motor-driven machine acquired by Vienna is unique in that it can serve as a fire engine, street sweeper, street sprinkler, and as a simple 6-ton truck. The transformation from sprinkling wagon into fire engine requires but the starting of a separate motor, which is independent of the motive power, and the attachment of a fire hose to the universal screw pump on the plug. When the sweepers are to be used, a simple movement drops them into position, and when the water reservoir is dismounted, the city has an ordinary 6-ton truck at its disposal.

¶The raising of stags for their horns is one of the curious industries in China, the horns being cut while soft each year and used in the manufacture of medicine.



Showing How the Movable Bars Give the Outline of a Model

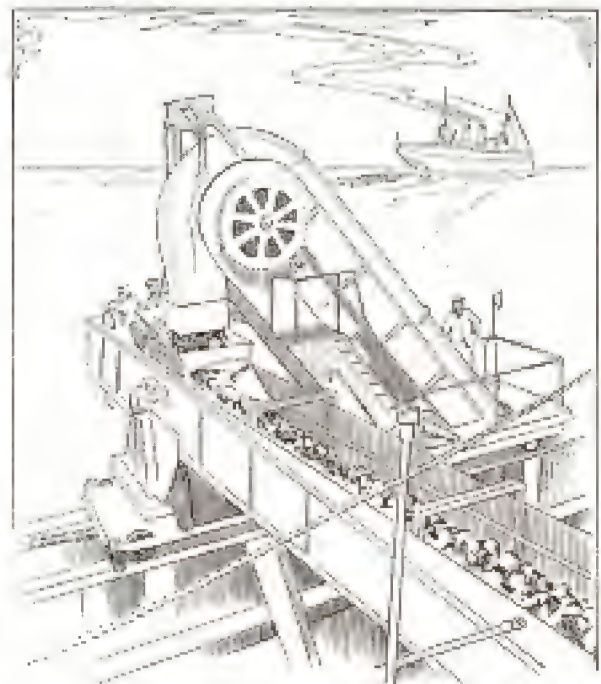


British Coaling Barge Serving Two Ships at the Same Time

AN INTERESTING BRITISH COALING BARGE

The coaling barge recently built for the London and Northwestern Railway has several interesting features. The vessel is 154 ft. in length, and has 18 coal pockets, nine on each side. Between the two rows of pockets is a well, 20½ ft. in depth and 4½ ft. wide, over which are run two carriages, each of which supports an elevator having 58 buckets. When the elevator is in position for coaling a steamer, the lower end is adjusted to the door of a pocket and the coal flows out of the pocket by gravity into the boot of the elevator, from which it is raised to the top by the buckets. When one pocket is thus emptied, the end of the elevator is adjusted to the bottom of another pocket and the process continues.

The barge's mechanisms are adapted to coaling ships either through side bunkers or through the hatchways in



Conveyor Used When Coaling a Ship through Hatchways in the Deck

the deck, a 34-ft. chute being used with each elevator for the former, and a conveyor being substituted for the latter. One of the illustrations shows

the barge coaling two vessels at the same time, but both elevators may be used simultaneously in coaling one ship.



Collapsible Steel Forms in Place for Construction of Lower Half of Concrete Sewer

CONCRETE SEWER BUILDING

The method of concrete sewer construction adopted in Paris, Ill., where 3,834 ft. of 5-ft. sewer and 710 ft. of 3-ft. sewer was laid, is here clearly shown. These sewers were constructed in halves, collapsible steel forms being used. The lower half of the 5-ft. sewer was reinforced with three $\frac{1}{2}$ -in. rods running horizontally, one rod being placed near the outside of the concrete at the bottom, and one rod on each side. When the lower half was set to such a degree that it would stand working on, the upper half was constructed, this section being reinforced with expanded metal, the long dimension of the mesh running lengthwise of the sewer.

By this method of construction, an average of 59 ft. of sewer was com-



Completing the Upper Half, with Expanded Metal as the Reinforcing

pleted for each 10 hours of work. The working organization consisted of a foreman and 14 men, who made all excavation and did all form and concrete work.

FRENCH AUTO EXPORTS AND IMPORTS

Although the number of foreign automobiles sold in France is still far below the number France exports, the import is steadily mounting, particularly of American cars. The total number of automobiles imported by France in 1911 was three times as great as for the year 1910. The number of French automobiles sold in the United States, however, is still, according to French figures, about 95 per cent higher than the American export to France.



Night Photograph of the New York Public Library Building
Courtesy of Collier's Weekly

STREET LAMPS GIVE LIGHT TO MAKE PHOTOGRAPH

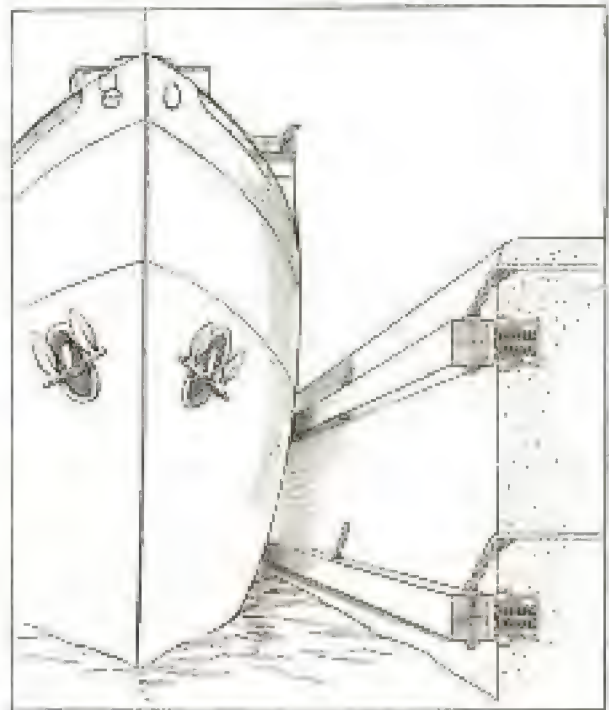
An unusual photograph was recently made of the front of the new Public Library Building in New York, the picture being taken at night by the light of the street lamps opposite the building. The photograph is regarded as an excellent specimen of photography as well as a clear picture of the library building, which has exceptionally dignified lines. The absence of glaring lights about the building is noticeable, at the same time every portion of the front is adequately lighted.

SPRING-BUFFER STRINGERS TO GUARD LOCK APPROACH

Fenders in the form of a continuous line of beams or stringers, 12 by 16 in. in section, suspended by short chains or hangers and bearing every 5 ft. against castings supported by four helical springs, placed in cups in the concrete, will protect the walls of the approaches to the Panama Canal locks against damage from the ships.

The approach to the locks is formed by an extension of the center wall to a distance varying from 1,445 to 1,700 ft. beyond the first lock gates, and by wing walls which make an angle of about 30 deg. with the outside walls and extend 300 to 400 ft. beyond them.

When the ships bump against these walls as they are hauled into the locks by the electric towing locomotives, the stringers will take the shock. The hangers are located every 15 ft. along the walls. The line of stringers on the lower approach walls at Gatun will have a length of 1,202 ft., and the shortest line will be 970 ft. in length, on the upper approach wall at Gatun. In all the locks there will be 48 rows of stringers, requiring 31,659 ft. of timber. On all the walls but the upper ones of

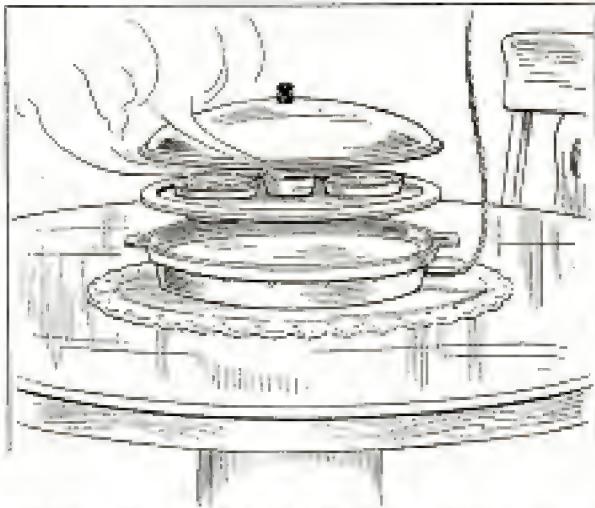


Vessel as It will Pass through Canal Lock, Showing Spring Fenders That will Protect the Approach Walls

the Miraflores and Pedro Miguel locks there will be a double line of buffers on each wall, the upper buffer being placed $2\frac{1}{2}$ ft. below the top of the wall, and the second one 10 ft. below the top. The buffer castings required will weigh 2,659,904 lb.

ELECTRICALLY HEATED SERVING TRAY

An electrically heated serving tray of interesting design has been invented by a Detroit woman. Extending across the flat bottom of the tray on the un-



Serving Tray Heated by Electricity, Compartments Separated to Show Construction

der side is a sheet of asbestos, the heat unit being attached to the under side of the asbestos. The flat-bottom casing entirely surrounding the heat unit has vent apertures in its upper portion, whereby heat generated by the unit is allowed to escape from the casing so as to preserve it in a cool condition. This casing is asbestos lined.

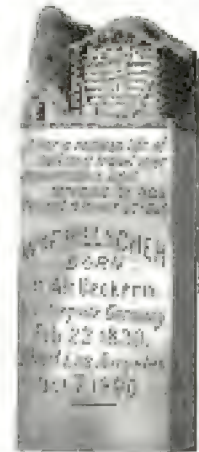
PERFUMED ASEPTIC GAUZE

Searching for a sterilizer that would have none of the objectionable features of those ordinarily used, which are either offensive to the smell, irritating and violent in their effect, or poisonous, a famous French physician, Dr. Championnière, has recently succeeded in compounding a sterilizing agent which he calls "berlagero," because it is composed of the essential

oils of bergamot, lavender, geranium and rosemary. The "berlagero" gauze has been used extensively for dressing wounds of all kinds, says La Nature, and found to be a perfect sterilizer. Besides, it has the valuable property that it may be left on the wound for several days without danger. Hence the wound need not be dressed so often, which is a distinct advantage.

PIONEER'S MONUMENT TELLS A STORY

While there are endless attempts to lend charm and poetry to the monuments in memory of the dead, it is seldom that the true note is struck. In fact "graveyard poetry" too often furnishes a theme for the professional humorist. In this photograph of the simple stone raised over the grave of a western pioneer, however, it seems that the idea of rest after many strenuous years has been well expressed. The miner's cabin, such as he raised with his own hands, the closed door, the idle gun and the miner's tools leaning beside the tunnel entrance where he sought for precious ore, all these tell in symbols what the epitaph repeats in a few simple and touching lines. It reads: "After a restless life of toil and travel over mountains and streams, he has found a home at last." Over the cabin door is inscribed the single word "Peace."



BRIDGES COLLAPSE UNDER WEIGHT OF ENGINES

The new conditions under which farmers are working is not more clearly illustrated than through two accidents which recently happened and which prove that stresses provided for in the construction of bridges over small streams or gullies a few years

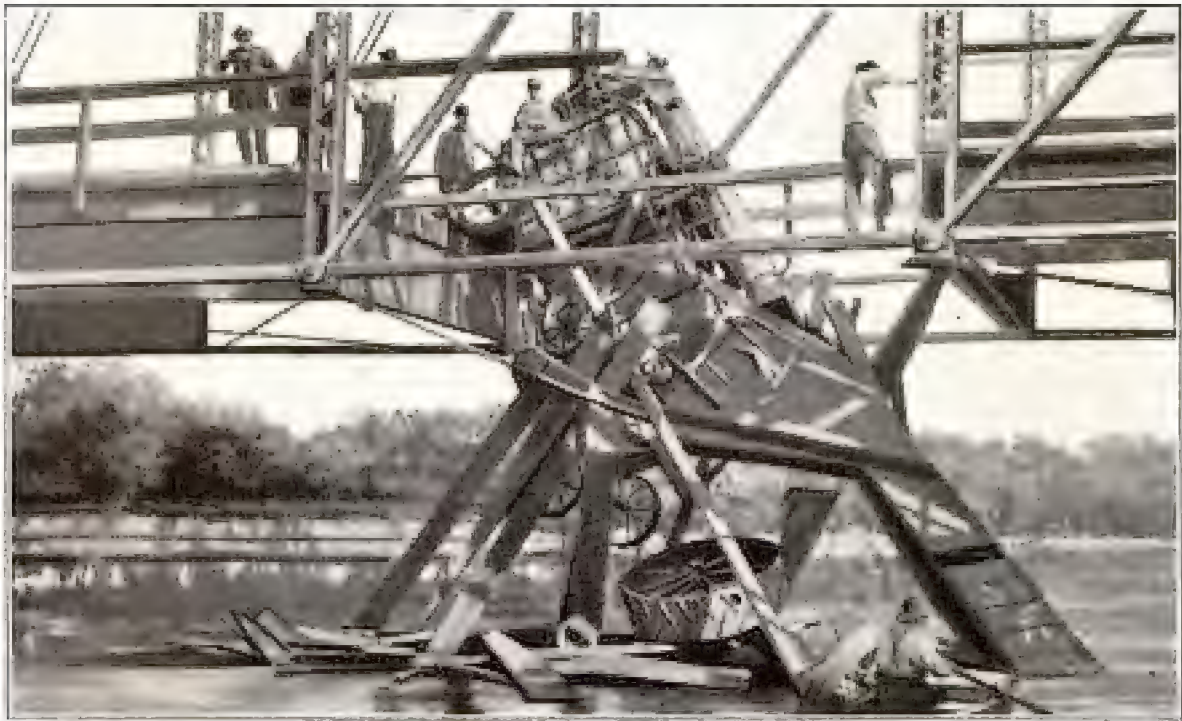


Photo by J. W. Fry

Threshing Machine and Engine Which Crashed through a Bridge over the Jim River in South Dakota

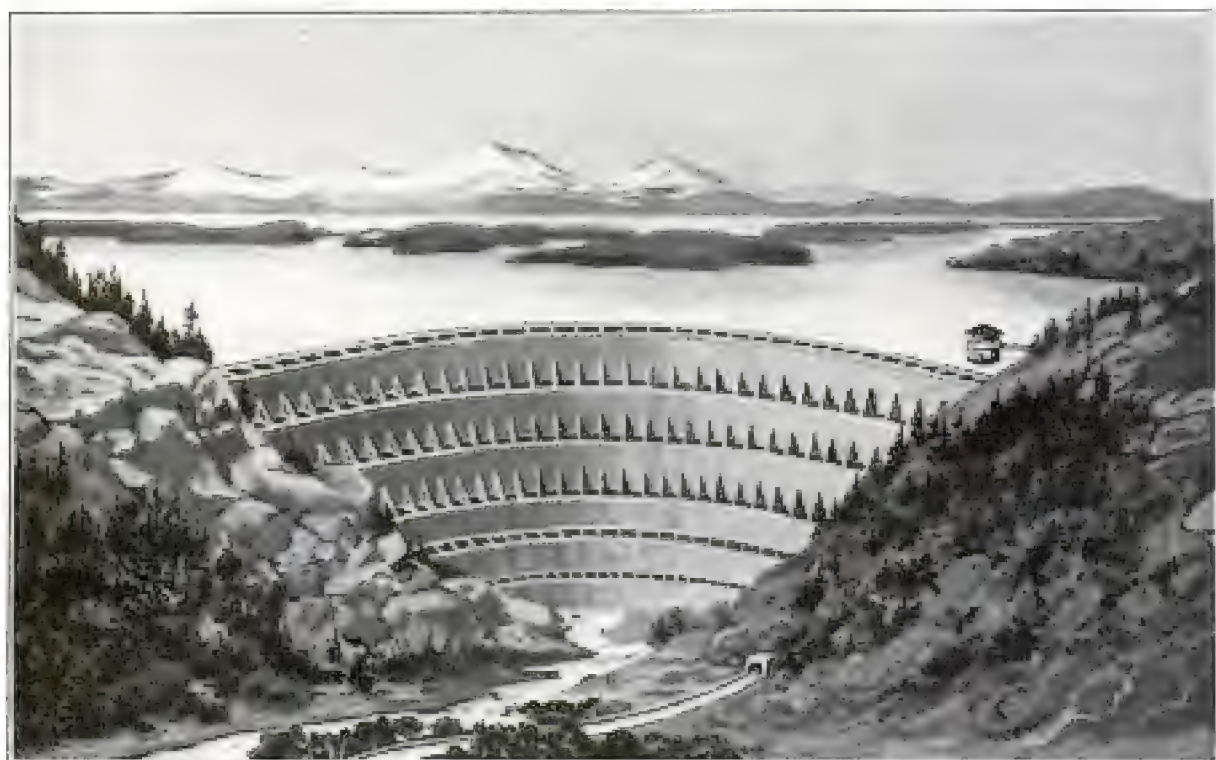
ago were considerably less than are required by the traffic on the country roads today. In different sections of the country, traction engines drawing agricultural machines crashed through bridges built but a short while ago. One accident occurred near Yankton, S. D. An engine drawing a threshing machine broke through a bridge over the Jim River. The engine went all the way through to the river, but the

threshing machine was caught on projecting timbers and did not touch the water. The engineer was thrown into the water but was unhurt.

A similar accident occurred near North Platte, Neb. Here, however, the bridge collapsed and fell into the stream. An investigation is said to have shown that weakness of the steel supports of this bridge caused its collapse.

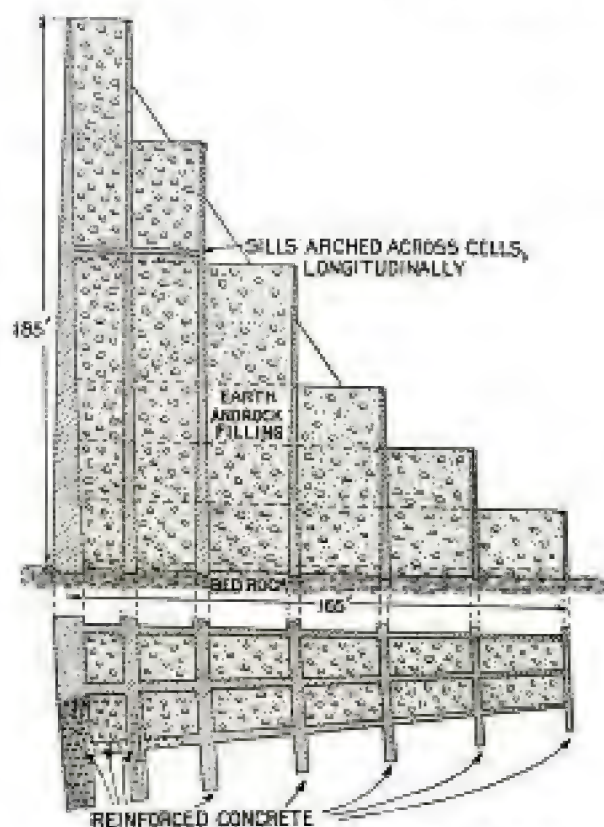


Bridge near North Platte, Neb., Which Collapsed with the Weight of a Threshing Machine and Engine



View of a Projected Cellular Reinforced-Concrete Dam from the Rear or Down-Stream Side

AN INEXPENSIVE CELLULAR REINFORCED-CONCRETE DAM IDEA



Cross-Section of the Dam, Showing the Cellular Concrete Construction Filled with Earth and Rock

In endeavoring to meet the demand for a cheap but substantial type of dam, having all the resistant qualities of the monolithic type without the expense of that type, one engineer has designed a cellular dam. He takes reinforced concrete as the most suitable material to furnish strength, and earth or rock as the most suitable to furnish weight, and, by combining the two in a cellular form, believes he has evolved a dam that is safe, strong, self-contained, and cheap.

The dam is built in the general outline of a solid concrete dam, but instead of being solid concrete it is constructed like a honeycomb, the cells being vertical. After the concrete work is finished, the cells are filled with earth and rocks laid down in water, so that the dam becomes practically a solid mass, the concrete giving the required strength, and the filler the necessary weight.

This engineer, in fact, says he sees no more reason in using a solid con-

crete dam than in using a solid bar of iron for an automobile axle. He says that the dimensions of a "gravity section" or "heavy masonry" dam are determined, not from a consideration of the strength of the material used in resisting tensile or compressive stresses, but by making it of such size that weight alone enables it to resist the overturning force of the water.

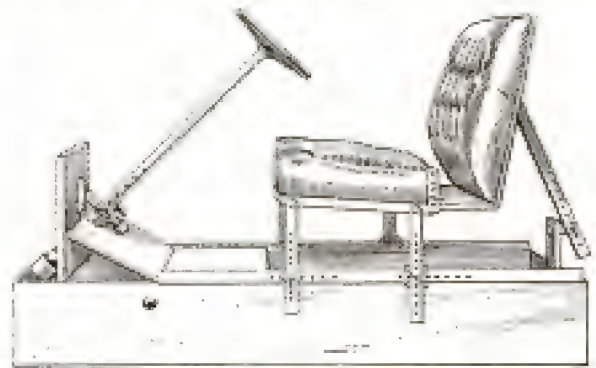
BRITISH-BUILT DREDGER FOR PANAMA CANAL

An extremely powerful dredger of the bucket-hopper type has been built in Scotland to the order of the United States government for carrying out some of the most difficult under-water cutting to be done in completing the Panama Canal.

The dredging gear is exceptionally massive, and is arranged to give three speeds of buckets to suit the various kinds of material to be dealt with. Two sets of buckets are provided, one for dredging soft material and one for dredging stiff clay. The bucket ladder is a steel girder of exceptional strength, and the bucket chain is unusual in its massiveness. The ladder, with its chain of buckets, links and pins, weighs more than 240 tons. The bucket ladder is designed for dredging to a depth of 50 ft., and the hopper capacity of the dredger is 1,200 tons.

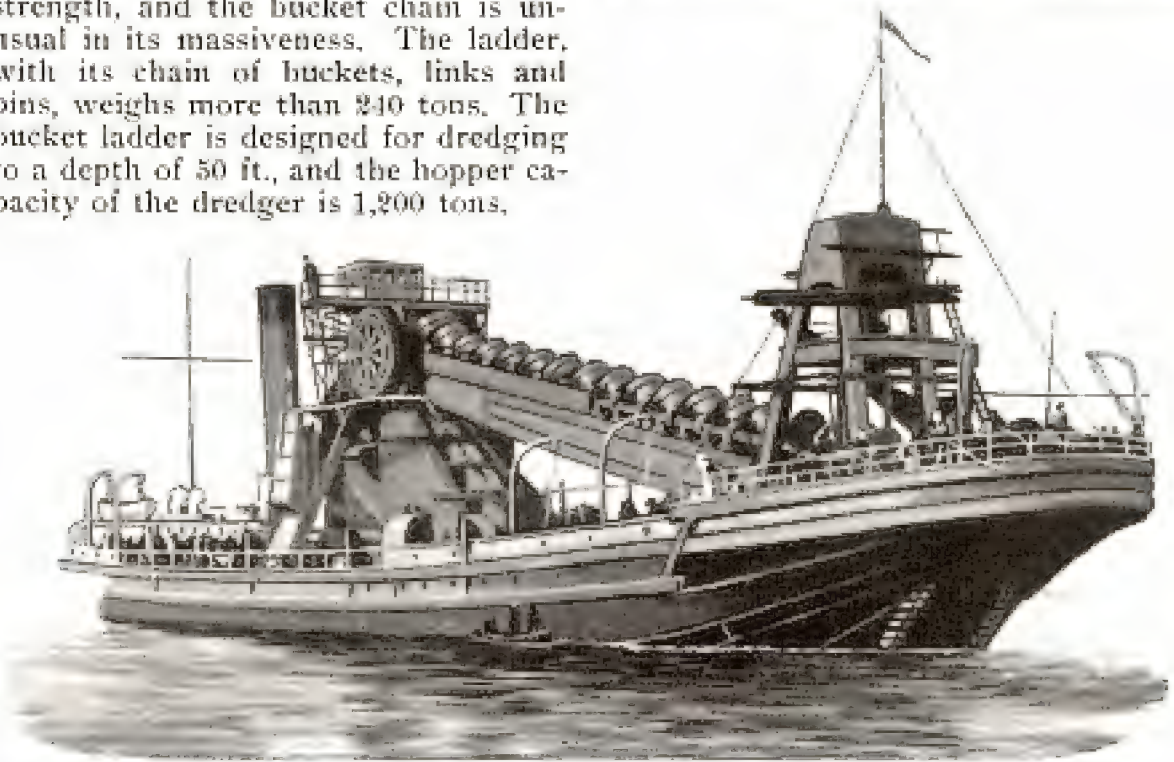
MEASURING DEVICE FITS CAR FOR ITS DRIVER

That the driving seat of an automobile be shaped and built to fit the long or short, fat or lean figure of its owner-



Measuring Device Designed as a Means of Fitting the Driving Seat of an Automobile to Its Driver

driver is being felt to be more and more essential by automobile manufacturers. One type of device designed to facilitate the taking of measurements is here shown. The seat bottom may be raised and lowered evenly or on a slant, the angle of the back varied, and the steering shaft shortened or lengthened.



This Powerful Dredger was Built in Scotland for the United States Government, and will be Used on Panama Canal Work

TEN YEARS' PROGRESS IN THE AUTOMOBILE

From the Motor, London

THE MOTORCAR OF 1902

The motor: Engines with one, two and four cylinders.

Connected by much piping.

Separate cylinder castings.

Small range of flexibility. Efficiency low, owing to a number of causes then unknown.

Camshafts driven by spur gears.

Exposed valves. Noisy valve gear.

Valves generally too small, and generally rendered inaccessible by contiguous gear.

Radiator of gilled tubing with exposed gills.

Radiator, in many cases, carried below frame and liable to become mud-coated.

Lubrication: Drip sight-feed lubricators with many pipes; reservoir usually on dash.

Pressure-feed arrangements liable to become choked.

Ignition: Coil and accumulator. Tube ignition considered by many as useful for emergencies.

Carburation: Most uncertain, owing to liability to recondensation. Starting up, very often difficult. Petrol consumption excessive. Efficiency, therefore, low.

Clutch: Leather-faced cone, seldom removable without affecting other units.

Gearbox: Meshing gears. Gear control on a quadrant. Gear-changing on some cars quite an art.

Transmission: Chain drive to rear axle. Chains liable to become choked with dirt and to stretch.

Brakes: External band brakes.

Springing: Not suitable for varying loads or bad roads.

Accommodation: Usually for four people in cramped and uncomfortable positions. Seating high and exposed. Dust-raising and dust-holding bodies.

THE MOTORCAR OF 1912

The motor: Engines with one, two, four, six and eight cylinders.

Cylinders cast in sets of two, three, or four.

Great range of flexibility. Greater efficiency with smaller engines.

Silent chain drive to camshafts.

Inclosed valves, quite silent in operation.

Desaxé crankshafts. Sometimes desaxé camshafts.

Radiator framed honeycomb or gilled tube.

Concealed gas and water and oil pipes.

Complete accessibility.

Lubrication: Pump-circulated lubrication, with single lead to and from small indicator on dash.

Oil-ways cast through crankcase.

Ignition: Magneto general. Supplementary ignition on some cars.

Carburation: Much more reliable and automatically adjusted to engine speeds.

Self-starters (by compressed air, electric current, or foot pressure) gaining favor.

Clutch: Leather-faced and metal-to-metal—easily removable.

Gearbox: Chain-driven gear shafts just introduced. Gears controlled through a gate.

Transmission: Silent bevel and worm drives to rear axles.

Brakes: Internal expanding brakes.

Springing: Well designed for varying conditions.

Accommodation: For five or seven persons in absolute comfort. Seating low and protected. Flush coachwork. Clever double-purpose bodies.



Cross Section of Pelican Wing in Block of Paraffin

STREAMLINE FORM IN AEROPLANE DESIGNING

By VICTOR LOUGHEED

This article is a continuation of the one published under the same title in the December issue of Popular Mechanics Magazine. In it Mr. Lougheed amplifies his data concerning the energy required to move objects of different form through the air, and suggests the practical application of this data to the forms and structures of future aeroplanes.

AS was suggested by the writer in the previous article, such extensive minimization of the forward resistances as is evidently feasible in a well-designed aeroplane, through the use of streamline sections for absolutely every part of the machine, cannot prove otherwise than of most momentous effect upon the problem of the energy required for human flight.

It is reasonable to assume that in nature's mechanisms of flight are embodied answers to all the problems of flight, awaiting for their discovery and utilization only the analyses and applications of sufficiently persevering and resourceful investigators. In no respect is this more apparent than in the differences between the efficiencies of the birds and the best aeroplanes.

To visualize this difference for the lay reader, it may be well to use an analogy that will be readily grasped by the non-technical mind. Assuming the ratio of 1 to 320, mentioned in the previous article, as that subsisting between the lift and drift in the cases of certain birds that were carefully observed, from this it must appear, by the simplest arithmetical application of the parallelogram of forces, that in calm air a machine equally efficient could from a height of one mile coast by the impulse of gravity alone to a distance of 320 miles before losing its altitude. Upon first consideration, this

seems almost an incredible flatness of gliding angle—but consider the matter another way. Almost every one knows how easy it is to slip on a very slight slant on an icy sidewalk, when the ice is wet, as, for example, on a sleety day, and a little thought will compel the realization that such a slant needs far less than a descent of one foot in 320 to permit pretty rapid sliding, especially if there were eliminated the air resistance, which at high speed is the most considerable retarding factor.

In considering the applications of the true principles of the streamline form to aeroplane designing, the writer came to the conclusion that the wings of birds offered a field of research that had not previously been properly exploited. To test this belief, with the assistance of Messrs. Edward Andrews and Ray Acre, he initiated last winter (1910-1911) some novel and thorough investigations into this interesting subject. The result was most surprising, in that it confirmed a previously entertained though then somewhat uncertain opinion to the effect that no accurate determination and publication of bird-wing sections had theretofore been made.

Doubtless the new results secured, and herein made public for the first time, differ so widely from previous work directed to the same object, chiefly because of the method employed

by the investigators in the present instance. This method was to take the wing from the freshly killed bird and fasten it in a wooden box, into which melted paraffin was immediately poured. When the paraffin had hardened, the whole mass—box, paraffin, wing, and all—was cut into regularly spaced sections with an ordinary handsaw. In this way there was obtained the most perfect and accurate data that it seems possible to secure in the way of exact information concerning the real form of bird's wings. This will be very apparent from the accompanying reproductions of the wing sections and plans of six large birds, and in the photographic reproduction of the cross section of the pelican wing in a block of paraffin.

It is, of course, to be understood that a bird's wing may, and probably does, undergo minor changes in form when it is carrying the weight of the bird in the air, but the extent of such changes cannot in any case be very great, and presumably is quite slight. This is because a bird's wing is for the most part very strong and stiff, while the flexibility of its weakest portion, the rear edge, undoubtedly is offset in large measure by pressure acting on the back of the wing in flight, in such manner as to counteract much of the pressure beneath the rear wing edge. The fact that there does exist such a pressure must, moreover, largely discount the deductions of Lilienthal and others as to wing deformability, when it is considered that their tests were made by loading inverted wings with sand and the like, with no consideration of the fact that under normal conditions pressures act against the back of a wing, counteracting a part of the load.

As a result of thorough investigation, it is most informing to summarize the

chief points in which the bird-wing form differs from the usual aeroplane-wing form.

These points of difference are two in number: First is the presence of an enormously thick and deeply downturned front edge; and second is the gradual modification from base to tip.

The reasons commonly advanced against the propriety of following nature in the aeroplane wing likewise are two in number.

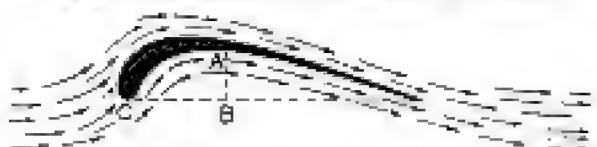
First it is argued that the thickness of the front edge is a necessity to provide for the thick bones of the wing, which lack the reinforcement of wire bracing with which the wing bars in an aeroplane can be provided, while the second supposition is that the modification and the depth of curve are involved by the flapping rather than by the gliding function of the wing—it being, of course, a fact that the most highly specialized soaring birds must on occasion be capable of flight by flapping. But it is also a fact that the most highly specialized flapping birds are in many cases good gliders. Moreover, there is every reason for supposing that even steady flapping, or "rowing flight," as it has been aptly termed, involves a gliding action of the wing—either simultaneous or intermittent with the forward-and-back propelling movements.

And as careful analysis thus suggests that the common reasoning is somewhat specious, experimental investigation seems to go further than this, and prove it to be absolutely unfounded.

In formulating the laws of flight, it is well to note that throughout all of the wonderful perfection of nature there is nothing more evident or impressive than the perfect interrelation of all laws and all structures. And, if



Thin-Section Aeroplane Surface and Air Stream, Showing the Formation of a Vacuum at the Point A



Thick-Section Aeroplane and Air Stream, Showing the Even Flow of the Fluid over All Portions of the Surface

the thick front edge is demanded in the bird's wing by virtue of a structural necessity, this is no reason whatever for supposing that it is not equally required by aerodynamic conditions. Indeed there is more reason, as there is more evidence, for supposing it to be required to meet an aerodynamic need, than there is for supposing it to be demanded merely to accommodate a structural necessity.

While the inference from this discussion is not that man would do well to imitate nature exactly in the design of his aeroplanes, yet even so imitative and, from present standpoints, so radical a policy, could hardly afford poorer results than are manifest in the outrageous weakness and gross inefficiency of many modern aeroplanes.

The one obvious argument against arbitrarily copying the wings of the largest bird, magnified to a scale to carry a man, is that the difference in size might demand a change in form. This undoubtedly is the case, but when it is considered that condors' wings are enough like those of a swallow to suggest that either a swallow with small condor wings, or a condor with magnified swallow wings, could fly in some sort of fashion—at least as well as some aeroplanes—it seems clear that such differences as exist relate to minor questions of the efficiency and the manner of flight, rather than to the fundamental one of its accomplishment.

Still more convincing is the further observation that the condor weighs 660 times as much as the swallow, while some of the lightly built man-carrying aeroplanes have weighed as little as 16 times as much as the condor.

Certainly it seems reasonable that

laws of wing design, which hold substantially good for a multiplication of 660, do not require to be revolutionized for a further multiplication of 16.

It is a suggestion of some significance in this connection that models afford a much closer check than does a large machine upon the quality of a result, because the size of a model may render it more directly and readily comparative with the results that can be shown to be secured by the birds.

Evidently, for example, in comparing a bird with a model of the same size, area, and weight, not until the model affords a similar flatness of gliding angle, as high and efficient sustentation, and as low forward resistance, can man consider himself demonstrated capable of applying all that the bird embodies and that his present models—and presumably, therefore, his large machines—do not.

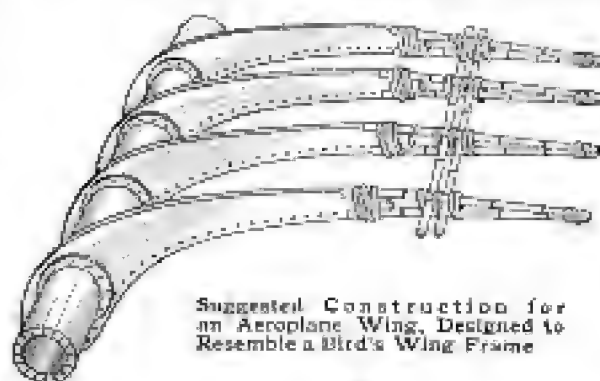
The fact that models are not generally built that compare in any degree favorably with the birds, thus construes itself into a most conclusive condemnation of the inefficiencies of present-day aeroplanes.

It might be easy to argue, of course,

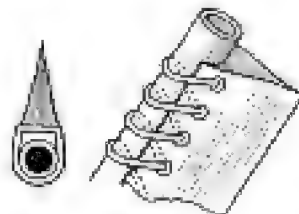
that a proper reason for aeroplanes differing so widely from bird forms might be found in the greater size of the aeroplanes demanding some difference in conditions and construction, but this

argument at once becomes untenable in the face of the showing that a similar shortcoming exists in models as compared with birds, in which case there is not the size difference to be cited as the reason for it.

In the writer's knowledge of the art, and with the exception of certain recent instances in which he has been personally con-



Suggested Construction for an Aeroplane Wing, Designed to Resemble a Bird's Wing Frame



Suggested Method of Building up Aeroplane Struts to Secure Stream-line Reaction against the Latter

cerned, no one has ever made a model in the way of an exact copy of any bird—of exactly the same size and proportions—and certainly until this is done and the results noted the field of model experimentation scarcely can be considered exhausted. Indeed, it in all probability is an absolute fact that prior to the publication of this article no accurate and systematic determinations of bird's wing sections had ever been made and the results made public.

Though not always so considered, especially by the rank and file of inadequately equipped experimenters, the absolute basis of all aeroplane flight is and always must be the wing, making the questions of wing forms and wing construction really the most important that the practical aviation engineer has to face.

And that a thorough knowledge of wing design, in combination with a proper conception of the action of a wing in the air, is the most important equipment an aeroplane designer can possess is a fact so evident that it can scarcely be gainsaid.

Since the forms and functions of wings constitute the absolute basis of flight, it follows that for a complete understanding of the laws governing this most wonderful of nature's phenomena, no investigation can delve too completely or exhaustively into the many questions concerning wing design and wing action. As summed by the late Professor Montgomery in the introductory paragraph of an unpublished paper, which the writer sincerely believes to be one of the most profound and illuminating contributions ever made to the literature of flight, he declares, with a truly remarkable insight when the time of writing is considered, that, "The wing of a bird resting upon a current of air, though the ideal of simplicity, is nevertheless as worthy the deepest study as the indifferent-shaped piece of lodestone, which carries in its bosom the wonders and mysteries of electrical science. As the one performs its operation without visible movement, by mysterious power, and excites ceaseless investigation, so the former,

poised in the air, develops and perpetuates a series of operations according to a code of mathematical laws, whose existence is unsuspected and whose secret workings, wonderful in the extreme, suggest further inquiry into the relations of forces."

The most fundamental function of an aeroplane wing is the sustentation of the machine to which it is attached. All other considerations concerning its design are secondary to this, which has to do most directly with the means whereby a heavy and substantial structure of solid materials can be made to rest and move about so securely upon an invisible highway of elastic fluid which in its ordinary manifestations appears so imponderable that the result secured has almost the seeming of something miraculous.

Perhaps the readiest means of visualizing the idea that under suitable conditions the free air of the atmosphere can become a most tangible substance, fully capable of transmitting and reacting to the most violent forces applied to it, is to cite the effects of winds. No one, who will think of the times he has had to lean heavily into the teeth of a gale, or who has had to resist being blown from the roof of a building or the deck of a vessel, will fail to remember the sensation as that of being upheld or thrust against by something almost like a solid substance. And if there be further considered the similar violence of the wind experienced in a speeding automobile or an open railway car, it at once is evident that it matters little whether the air be moved against a resisting object, or the object against the air.

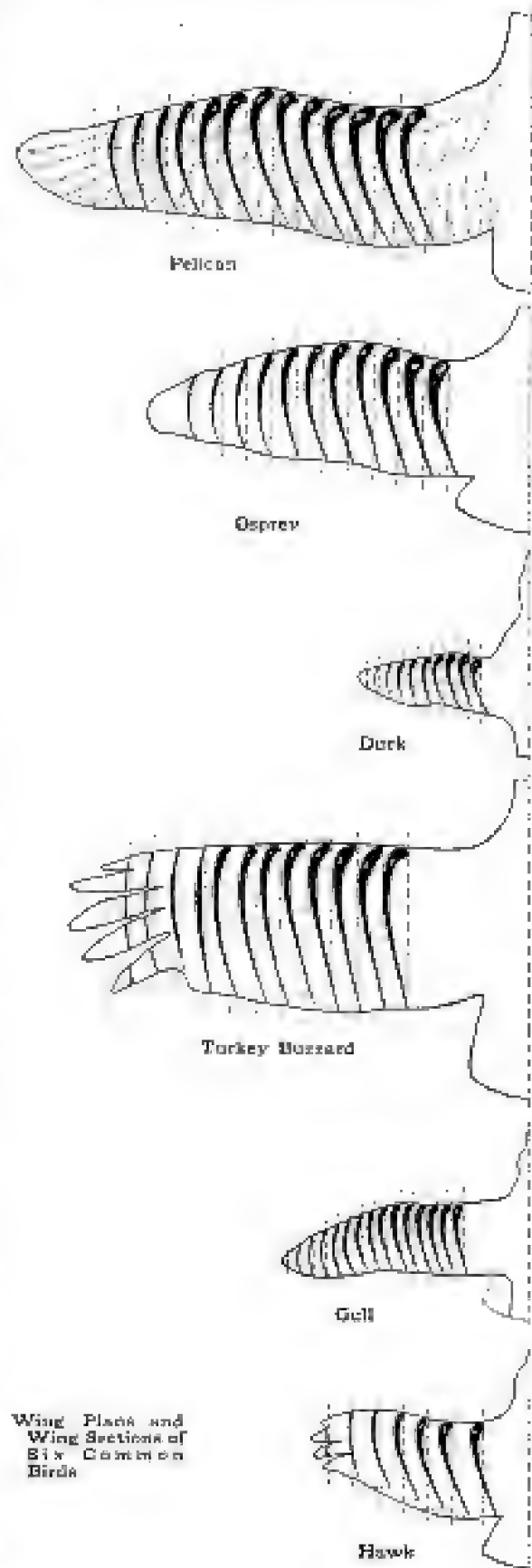
Wind pressures against plane surfaces have been extensively investigated by many engineers, largely with reference to the force of their effects upon the integrity of high buildings, bridges, and the like. These investigations have led to the compilation of tables, which are commonly used by architects and engineers for the computation of wind stresses on tall and exposed structures. The absurdity of continuing to apply these tables to the

"head resistances" of aeroplanes, in the face of what the writer has demonstrated with reference to the reaction recovery of the most of the energy expended in moving a properly formed body through a fluid, is a folly so serious that it is to be hoped for the advancement of flight that it will not be long persisted in.

In conclusion, it may seem to the casual reader a venturesome thing to offer even a suggestion of the extensive development of aerial vehicles that is quite upon us. Yet it is to be remembered that even the most accustomed forms of modern transportation—the railway, the steam vessel, the bicycle, the automobile, etc., all had their very inception actually or almost within the lifetimes of people now living, while, without exception, their development from the experimental state to the status of unquestioned utility has covered much shorter periods.

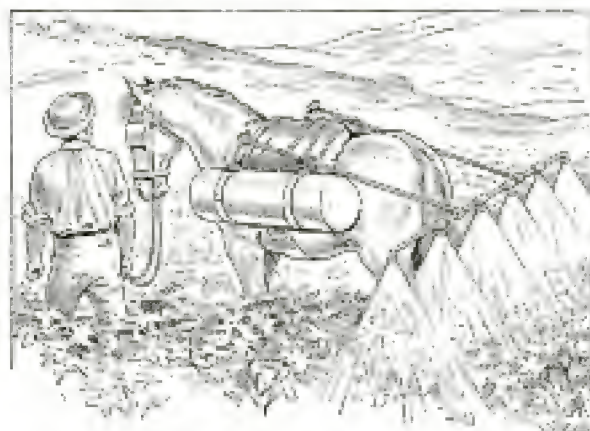
Certainly it cannot be escaped or overlooked that the atmosphere as a medium of travel affords more room with less limitations than apply to any other mode of transportation; that it is the medium used by birds for the transportation of considerable weights at great speeds with absurdly small power—many times less than man has available for the same use—and that, though the bird possesses the almost inimitable co-ordination of animal mechanism, man has nevertheless proved already capable of imitating this co-ordination and control not only in a considerable degree, but also with remarkable success and safety—the lives so far lost in this growing conquest of the air with heavier-than-air machines being much smaller for given distances traveled than proved the case in the development of apparently much safer means of terrestrial and aquatic travel.

Indeed, so far has aeroplane design already progressed, the one great remaining problem has become that of aeroplane efficiency—to the solution of which the writer believes that he has been herein privileged to point the way.



SPRAYING VINEYARDS IN FRANCE

A method of spraying vineyards much in vogue in France is here shown. Two compressed-air sprayer tanks are



A Pack-Horse Outfit for Spraying Vineyards

strapped to the horse's back and the liquid is discharged through a pipe having six spray heads. The discharge pipe is supported in position back of the horse by means of the two pipes connecting it with the supply tanks.

IS IMPORTED ELECTRICITY SUBJECT TO DUTY?

The municipal authorities of Copenhagen, the capital of Denmark, propose to buy electricity for lighting and other purposes from a power station at Trollhättan in Sweden. This, however, brings about a peculiar situation. Coal is liable to duty in Denmark and the government must decide whether duty should not also be paid on electricity, and solve the problem of finding an equitable rate of duty as compared with that imposed on coal. Tariffs in Denmark are not, excepting in a few instances, figured on an ad-valorem basis.

A railroad line is contemplated from Egypt to India, running across Northern Arabia and through Central Persia, wholly in territory where British influence is predominant. The line would shorten the journey from Egypt to India by no less than six days.

A BIRD MARKET THAT IS "PARADISE"

To people who love birds and small animals, a visit to the ordinary bird store, where the little feathered creatures are prisoners in tiny 6-in. boxes in semi-darkness, foul air and dirt, is a painful experience, altogether too suggestive of a penitentiary. But a visit to a certain bird market or store in Los Angeles, owned by a lover of nature who has always had a passion for collecting rare and beautiful pets, though only recently commercializing his hobby, leaves no such impression.

It is said that there is no other such bird store in the world, and that even the finest public aviaries in the great metropolitan parks do not, in many respects, compare with it. It comprises about 18,000 sq. ft. of ground, placed under wire netting, plentifully shaded by acacias and palms, provided with grass and flowers among which the birds fly or run about seeking food,

and supplied with fountains and ponds for the water fowl. It is all open to the public, and any one can walk along the gravel paths, with doves, quail, and other shy birds almost under foot. More than 1,500 birds, comprising about 80 varieties, some of them exceedingly rare, are at present accommodated. Among them are "bleeding-heart" doves from the Philippines, so called because on the pearly grey breast of each is a dull red stain exactly like that caused by a shot wound; an African jungle fowl, said to be the progenitor of the ordinary barnyard fowl; a white pheasant of absolutely snowy plumage, and crested ducks from Holland. With the exception of the birds of prey, the birds are allowed the utmost freedom, and small animals, including squirrels, monkeys, puppies, and rabbits run about like one big family.



Children Looking In at the Birds and Animals from the Street Sidewalk



The African Jungle Fowl



A View of the Wired-In Area



A Dancing Cockatoo



Holland and Native Wild Fowl in Unique Bird Market

LAMPS IN STAIRWAY WALLS ILLUMINATE LANDINGS

Although the concourse and waiting rooms of the big Chicago & North-



Glass-Covered Lamps in the Stairway Walls of the Chicago & Northwestern Railroad Station in Chicago illuminate the Landings

western Railroad passenger station in Chicago are well lighted, an ingenious stair system of lights has been adopted as a guard against accidents. Pocketed in the side walls of the main stairway at each landing, where the last step ceases or the first step begins, are glassed-in electric lights. These throw a bright light at the points mentioned, drawing attention to the change.

TO MAKE TEMPERATURE-PROOF TUNING FORKS

A French scientist has made a tuning fork that, it is claimed, is not affected by changes in temperature, and is therefore invariable. The material used in the fork is Guillaume steel, also called "Invar" on account of its almost complete insensibility to temperature variations. The announcement of this discovery was made at a recent meeting of the French Academy of Sciences.

¶An enterprising Chicago burglar has provided himself with a motor truck with which to remove his "swag" after he has "tapped a crib."

TRAMPS BUILD CHAPEL FOR AN ORDER OF MONKS

In the hills near Garrison-on-the-Hudson, N. Y., is a handsome, substantial chapel which will long withstand the elements and be pointed out with pride by the wandering fraternity as a monument to unusual industry, for a considerable part of it was erected by tramps. The story of the chapel and the "Brother Christophers," for so they are called by the monks, after the walking saint, Christopher, is of more than ordinary interest.

About two years ago a number of Friars of the Atonement, headed by the Rev. John C. Hawes, an Anglican missionary from the Bahamas, who had been received into the Catholic

church, selected a site for a monastery in the hills at Graymoor, near Garrison. They had no money, but set to work with an enthusiasm poverty could not dampen, and erected a log cabin, in which they slept in bunks, built tier upon tier. Sympathizers in the neighborhood supplied a few blankets, and those of the monks who had no blankets slept as best they could without. They did their own cooking, tailoring, sandal making, etc., and received many contributions, but most of these went to the wayfarers who were guided to the spot by a series of rough crosses placed at intervals from the base to the summit of the hill.



At Work on the Spire of a Chapel Built by Tramps and Other Visitors under the Direction of Priors of the Atanement near Garrison-on-the-Hudson, N. Y.

At first the tramps or Brother Christophers were given the hospitality of the monastery without any thought of worldly return, but one of the monks, Father Francis, proposed that they be set to work building the chapel. Consequently, the next tramp to arrive was told that the time had come for him to do a little work. After being fed he was set to work excavating for the foundation, was soon joined by another, and still another, and the task began to progress. They were fed well and given a good bed, and the first day the novelty of it all appealed to them. The second day, however, the novelty somewhat dimmed, they continued on their way, but others came to fill their places, and the chapel slowly arose, there always being a sufficient number on hand to continue the work. Some proved to be skilled workmen. All were able to do something.

But all who have worked on the building are not Brother Christophers. Nearly every trade and profession has had a hand. School-teachers taking a vacation in the neighborhood were

lured to the spot by the novelty of it and shouldered a hod with the rest of the workers. Few ever came to watch the work without taking a hand.



A Monk and One of the Brother Christophers at Work

SECTIONAL EMERGENCY TIRE

A sectional emergency tire designed to prevent a tire being ruined by running on it in a deflated condition has made its appearance. It is mounted



directly upon the deflated tire, and consists of three sections of solid rubber in which is imbedded a flexible rack. This rack projects beyond one end of each section to lock in

the adjacent end of the next section, thus forming a hoop about the regular casing.

DISEASES OF ALUMINUM

Utensils of aluminum often undergo rapid changes which may result in their destruction. These "diseases" take the form of swellings, eruptions and blisters on the surface and seem to be caused by atmospheric agencies, such as variations in temperature, humidity, etc., or by the nature of fluids contained in the utensils. Two German investigators have recently studied these phenomena, says *La Nature*, and arrived at the result that only cold-rolled aluminum is subject to these deteriorations, while if the metal is rolled at a temperature of 450 deg. Centigrade (842 deg. F.) it is practically immune from any but very superficial affections, which do not impair the durability of the utensils.

☞The earliest use of the slot machine, according to the *Journal of the Franklin Institute*, was in the Egyptian Temples where the device was used to enable the worshiper to sprinkle himself with holy water.

☞French chemists in Cochin China have succeeded in making a cheap and palatable wine from bananas.

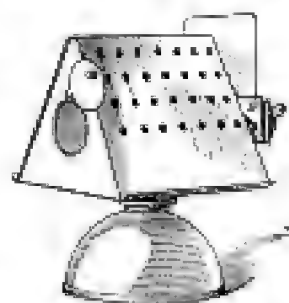
BEER AGED BY NEW PROCESS

A company has been formed in Prague, Bohemia, to exploit a new process by which beer can be more quickly fermented or "aged" than by the present method of storing it in cellars. By this new process, in which the beer will be produced sterile in closed tanks, and will be matured and made ready for the market in 8 to 12 days, the cost of production will be reduced about \$3.25 per 100 gal., which would mean an annual saving of about \$5,000,000, if all the beer made in Bohemia were so manufactured. About three months is the time for the old method.

The aging by the new process is effected in aluminum tanks having a capacity of 8,000 to 10,500 gal. The fresh taste and smell of the beer is removed during fermentation through the action of the carbonic acid produced, this acid being collected, washed, and purified, then again forced through the beer. The entire process requires continual washing and refining.

DRYER FOR FERROTYPES

A handy device for the quick drying and polishing of ferrotypes has been placed on the market. Made of brass and provided with an inside double burner and a safety airtight alcohol tank, it can be easily attached to any kind of tripod. It is claimed that by this system of drying ferrotypes the emulsion will not get soft or become discolored, and that a glossy finish will result no matter how cheap the plate used.



☞An Indiana man has invented a form of scissors provided with a guard, so that buttons can be cut from cloth without injuring the cloth.



Bring "the Wagon" Home, John

By WALLACE IRWIN

(A Popular College Air Adapted for a Chauffeur's Quartette)

THERE'S a car of ancient race
 Called "the Wagon" 'round our place;
 It's mildewed and its tires are *en polage*.
 Back in 1904
 Folks admired its stroke and bore—
 Now it's doing errands 'round the old
 garage.
 Though its oil cups leak and drip
 And its cylinders they skip,
 Experts say it was a racer in its day,
 That it won a prize or two—
 Now, alas! it's overdue
 And its driver sings this melancholy lay:

"Bring the Wagon home, John. (*close harmony*)

It cannot last for long.
 The racing blood was proud of it
 When you and I were young;
 It once went 60 miles an hour—
 A record for its time.
 To drive it 60 miles a year
 Today would be a crime."

Though it belches smoke behind
 And the gears—gee, how they grind!
 And the poor exhaust's exhausted, so they
 say:
 It has sporting spirit yet—
 There is life in it, you bet!—
 Why, you should have seen 'er speed it
 yesterday
 When the road she tried to crab
 From a wheezy taxi-cab—
 Nearly won—and then she stalled, the dear
 old tub!
 For her engine got a "stitch"

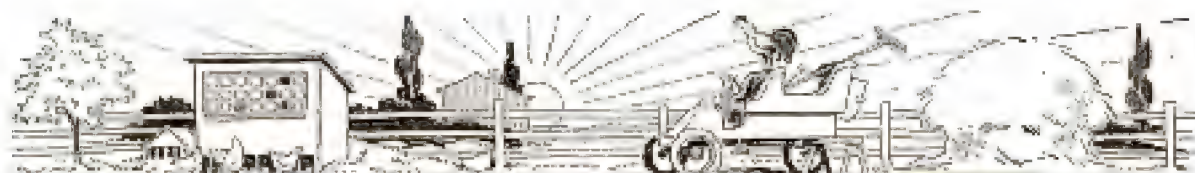
And she stranded in a ditch
 With her differentials wrapped around her
 hub.

"Bring the Wagon home, John. (*close harmony*)

She's useless as a hack—
 Her tonneau is the antique style
 That has a door in back.
 She's modeled after Noah's Ark,
 Her whims amuse the boys;
 But what she lacks in style and speed
 She sure makes up in noise!"

So she stands, a relic ripe
 Of the old steam-roller type.
 Like some queen who's much too old to
 reign, and won't.
 Such renown of former years
 Clings about her spavined gears
 That we ought to take our caps off—but
 we don't.
 From her sprockets to her clutch
 She has cost so doggoned much—
 Counting accident insurance and repairs—
 That we often tell the boss
 How she's running at a loss.
 So we coax him with this string of college
 airs:

"Let's leave the Wagon home, Boss,
 For she's a public 'queer'.
 Just leave her in the chicken-yard,
 A home for Chanticleer.
 She may be resurrected, Boss,
 Upon the Judgment morn—
 For 'er only part that's still O. K.,
 By jingo, is 'er horn!"



THE RELATIONS OF CHEMISTRY AND ENGINEERING

"Chemical engineering," a profession combining chemistry and engineering, will be one of the most important callings of the coming industrial era, says John B. C. Kershaw, in an article in *Cassier's Magazine*.

The writer states that recently he had some correspondence with one of the most notable and successful English electrical engineers of the present day upon the relations of chemistry and engineering, and in the course of this correspondence the latter expressed the opinion that the chief work of the industrial era which is now dawning will be carried out, not by chemists, and not by engineers, but by men who combine a working knowledge of both chemistry and engineering, who will as time passes on form a new profession of "chemical engineering."

The material and industrial progress of the nineteenth century from its dawn to its close was dominated by the engineer, and the chemist, excepting in Germany, was relegated to an inferior and much more humble position.

The writer points out the important part played by the chemist in the development of the steam engine, the gas engine, the manufacture of steel and cement and the separation of metals from ores.

The twentieth century will, no doubt, be marked in the history of the world's manufacturing industries by the success of the efforts made to utilize "waste products," and in this field of activity the chemist or chemical engineer will again take the leading rôle. Power from the waste gases of blast furnaces is already generated upon a large scale, both on the Continent and in this country. There is little reason to doubt that, as time passes on, this hitherto wasted source of energy will be more and more utilized for various purposes. But the design and control of large

gas engines of 1,000 hp. and operating with blast-furnace gas demand chemical knowledge, and any larger installation of this kind can only be erected and run with success by men possessing both a chemical and engineering training. Gas analysis will, in fact, form a regular feature in the operation of any large plant for generating power from blast-furnace gases, and the man in charge must be able to interpret the results obtained rightly, if the highest economy is to be attained.

Waste products containing combustible matter are now burned in special forms of furnace or are utilized in gas producers, in order to recover the heat value of the combustible, and here again chemical and engineering knowledge is required in order to design and work the furnaces or producers with the maximum of efficiency. Refuse destructors also demand similar qualification in those who design and control them.

The manufacture of useful products from the slag of blast furnaces and from the clinker of furnaces and destructors is another branch of modern industry that is growing rapidly in importance and in which large profits can be made.

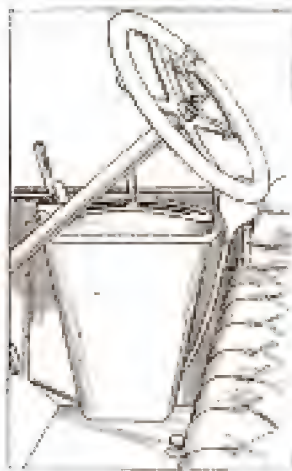
The manufacture of artificial stone and of building slabs from the clinker of destructors and other similar types of furnace is also a growing industry, and one in which a knowledge of both chemistry and engineering is demanded.

There are many other manufacturing industries in which a more extensive knowledge of chemistry is of supreme importance for those who are in positions of authority. The aniline-color industry is perhaps the most notable example of a large industry created by the labors of the chemist in his laboratory. Other manufactures similar in character are those of artificial indigo, madder, silk, rubber, leather, wood and ivory, and last but not least, that of

artificial nitrates from the air. In all these manufactures engineering and chemical knowledge must be combined in order to obtain the best results, and it would be difficult for either an engineer or chemist alone to overcome all the difficulties met with.

GEAR LEVERS WITHIN DOOR PANEL

An ingenious disposition of the control levers of automobiles having the four-door type of body has been made by one of the American companies. Instead of placing both levers outside or inside the panels, or placing the emergency lever outside and the gear shift inside, this company places



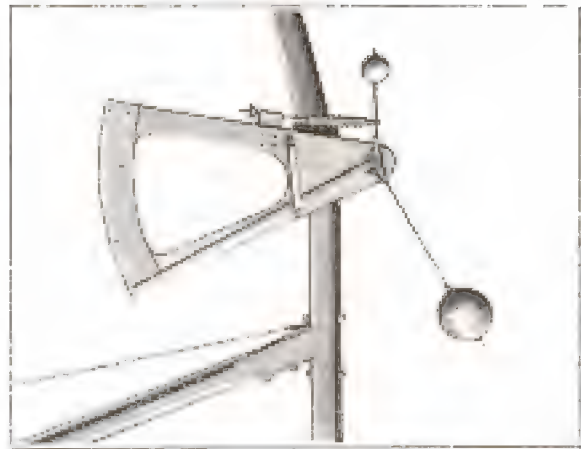
both levers within the panel, as shown in the illustration. Thus, the straight-line effect of the body is not marred by outside levers, nor is the driver inconvenienced by having them on the inside.

The tops of the levers protrude just high enough above the panel to give a firm handhold. The gate of the gear-shift lever is in the top of the panel.

AN AEROPLANE SPEEDOMETER

A very successful, while at the same time a very simple, aeroplane speedometer is that illustrated in the accompanying view of a portion of a Maurice Farman biplane, on which it has been extensively experimented with.

As shown in the illustration, the essential elements consist of the large ball against which the wind pressure



Speedometer Attached to Aeroplane Fuselage

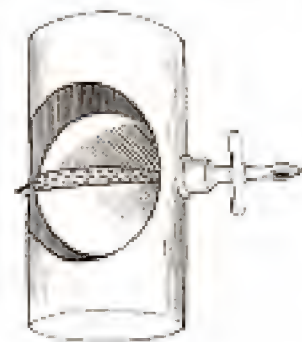
acts, the heavy ball weight below, and, connected to these and pivoted on the same support, a long indicating arm working over a sheet-metal sector.

The proportioning is such that with a uniform calibration on the scale, the wind pressure can be read directly in miles or kilometers per hour. In addition to its function as a speed indicator, the device also shows any longitudinal tilting of the machine, it acting in this case as a gradometer.

The new speedometer is the invention of Captain Eteve, a well-known French army officer who has had much experience in aviation, and whose high standing as an engineer leads to great expectations of the device.

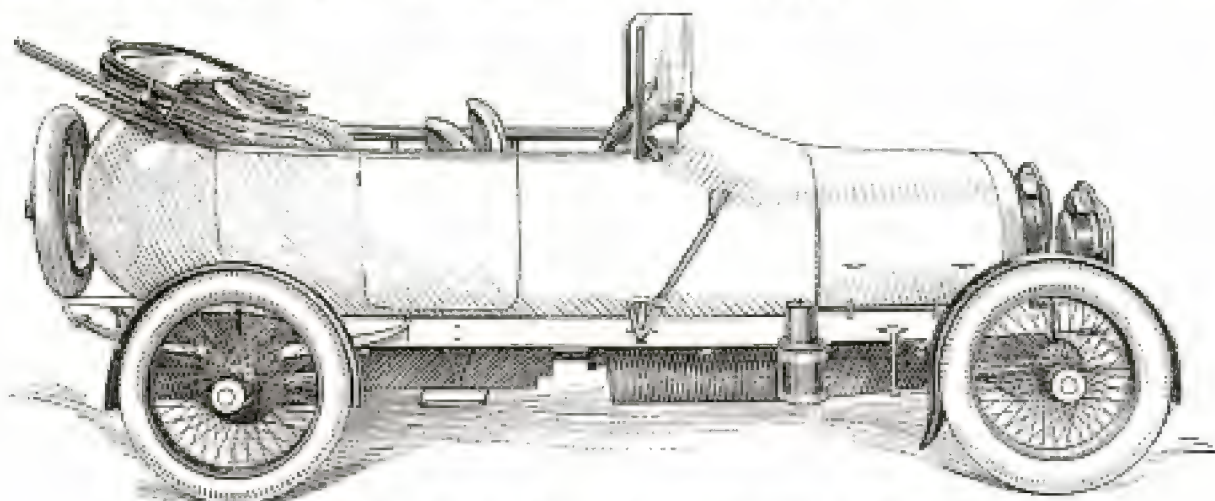
DAMPER PREVENTS SPARKS GOING UP CHIMNEY

Almost every householder will be interested in a new device which is designed for the purpose of preventing sparks from flying up the chimney, the invention having been perfected by a man whose home was almost destroyed by fire started by such sparks. The idea is extremely simple and consists of the



attachment of a disk of wire net or perforated sheet iron to the spindle that operates the damper in the stove or furnace pipe. The disk is set at

made to go with this outfit and is provided with a rubberized hood or flap which can be pulled down over the neck and ears.

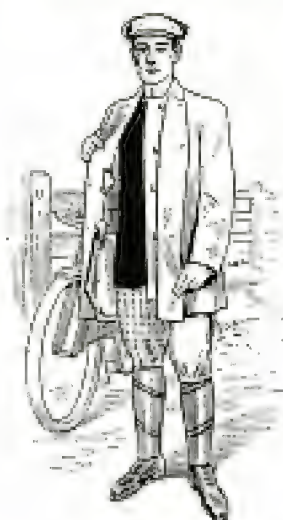


Automobile Having Mudguards of the Bicycle Type, Single Steps in Place of Running Boards, and Detachable Arm-Chair Seats

right angles to the damper and in no way interferes with the manipulation of the latter, although it effectually prevents the escape of sparks up the chimney.

RAIN-TROUSERS GO WITH RAINCOAT

The newest thing for motorcyclists or automobilists is a raincoat that is



provided with trousers, the coat and trousers being all in one garment. The trousers part of the garment is designed only to cover the knees of the wearer and can be turned up inside the coat when not in use. To all intents and purposes, however, they are real trousers and af-

ford a maximum protection while occupying a minimum of space. They are made of woolen or rubber, as is desired, and have the appearance of ordinary clothing. A leather cap is

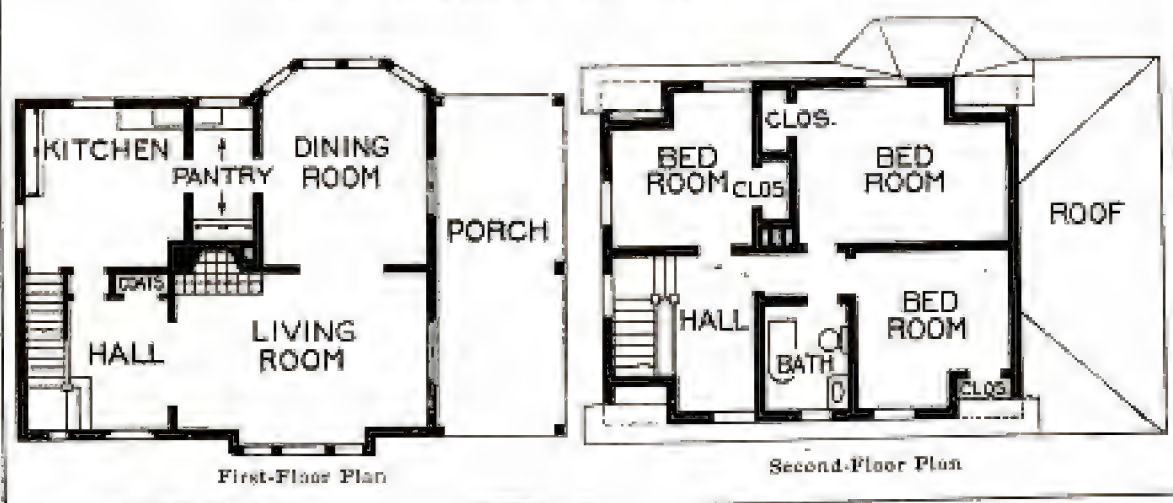
AUTOMOBILE WITH MANY NEW FEATURES

An automobile body combining the best features of several well-known types of bodies has been turned out in London. The mudguards are of the bicycle type, the front ones move with the wheels, and all four do not weigh as much as one ordinary mudguard. There is only one door on a side, and the running board is replaced by a single step. The seating arrangement comprises four detachable armchairs provided with deep comfortable cushions. The front seats are slidable and can be adjusted to the driver's convenience, while the back seats pull forward and disclose a large mahogany cupboard having shelves and drawers for the storage of tools and small articles, and space for two motor trunks. As the seats are detachable, the car can be used with either one, two, three or four seats, as desired.

CPekin, China, the only world capital without a street-car system, is about to be invaded by the trolley, arrangements for the construction of an electric line having been finally completed after months of negotiation.



View of the House Showing Front Entrance and Side Porch



William J. Hoyer, Architect

WELL-ARRANGED PLAN FOR A \$3,200 HOUSE

There are several distinctive features in the plans for this frame and stucco house, aside from the moderate estimated cost of \$3,200. The building is planned to have not only an attractive exterior, but large, comfortable rooms arranged in a most convenient manner. One of the features is the porch which is placed on the side instead of at the front and is reached through French windows from the living room and dining room. The interior finish should be simple to keep the cost within the figures of the estimate. There

are to be six rooms, bath, and a reception hall. The dining room is separated from the kitchen by a large pantry, and ample light is provided for all the rooms through an excellent arrangement of the windows. The estimate of the cost is based on the price of materials in Philadelphia.

CA French scientist attributes the benefit of sunlight at high altitudes upon persons to a preponderance of ultraviolet rays which induce a more active circulation of the blood.

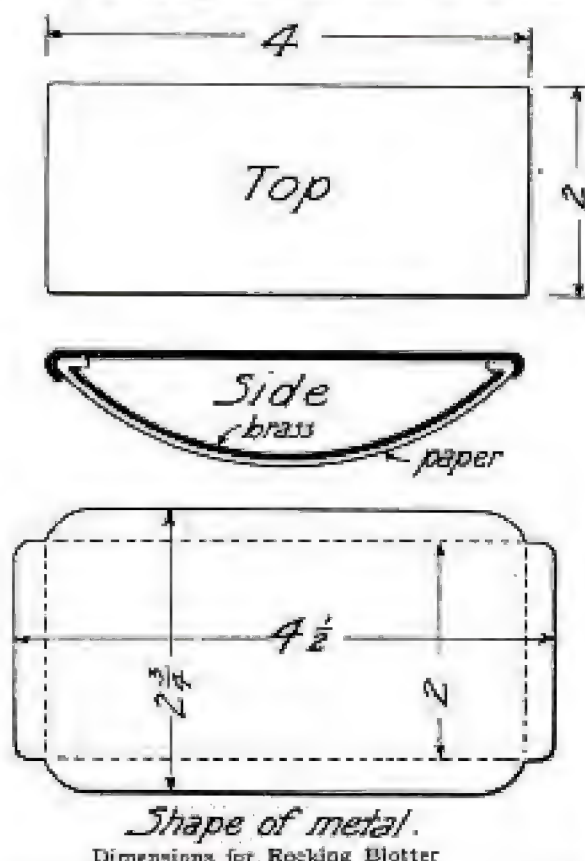


METAL WORK AND ETCHING

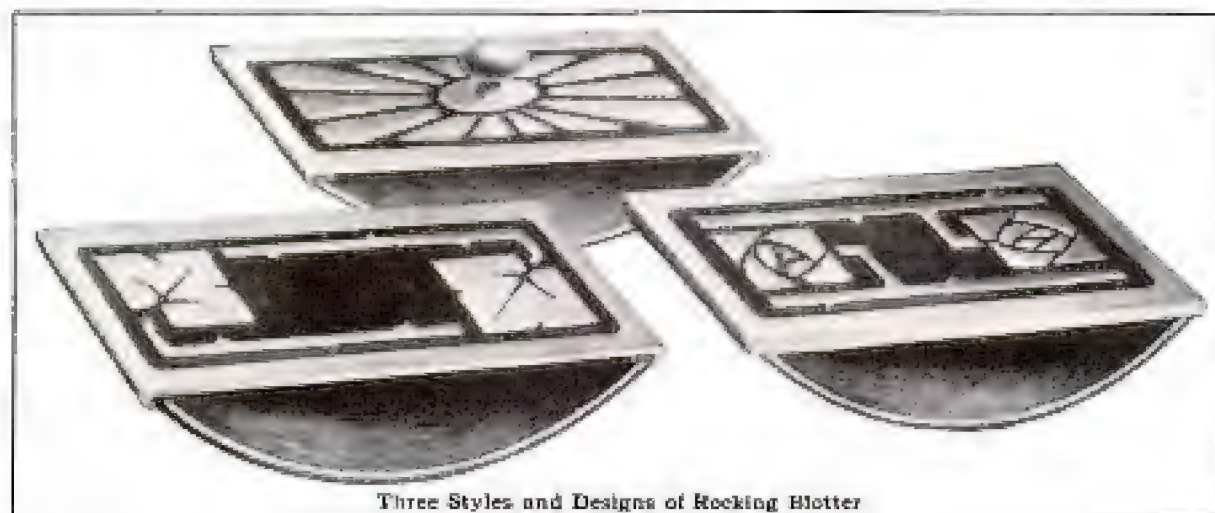
By JOHN D. ADAMS

Part IV—Rocking Blotters and Desk Calendars

We now come to a rather interesting feature of our desk set—the rocking blotter, of which we illustrate three variations. The one to the left is the simplest of all, consisting of but two pieces of metal, the top one of which is bent over at each end, so that when the curved portion, covered with blotting paper, is sprung into place it will be securely held. The top in this case should be of No. 16 gauge brass or



copper and the bottom of 20 gauge spring brass or bronze. In the right-hand design, the side edges of the top are also bent down, which gives the blotter a more solid appearance and permits of using a lighter gauge. The third design is provided with a knob, which may be of hard wood, ebony preferred, or else in the form of a small metal handle fastened in place with rivets. All dimensions are given in the line



Three Styles and Designs of Rocking Blotter



Three Designs for Desk Calendar

drawing except for the length of the spring bottom, which is $4\frac{1}{2}$ in. The various bends are indicated by the dotted lines.

The most important point in the construction is to secure good sharp bends, which can only be accomplished by having the metal soft, a condition that is easily arrived at by heating the brass or copper over a gas flame and plunging it into water. When all bending and filing has been satisfactorily completed and the metal made clean, lay out the desired design on a sheet of paper and then transfer it to the top. Paint out the portions that are not to be etched, using the asphaltum or the regular etching enamel as sold by dealers in manual-training supplies; and then proceed with the etching in the two-to-one nitric-acid solution. The etching completed, the paint may be removed by kerosene, after which the metal is to be thoroughly cleaned. The coloring, in the oxidized or verdigris effect as desired, is now to be attended to and made permanent by coating with lacquer.

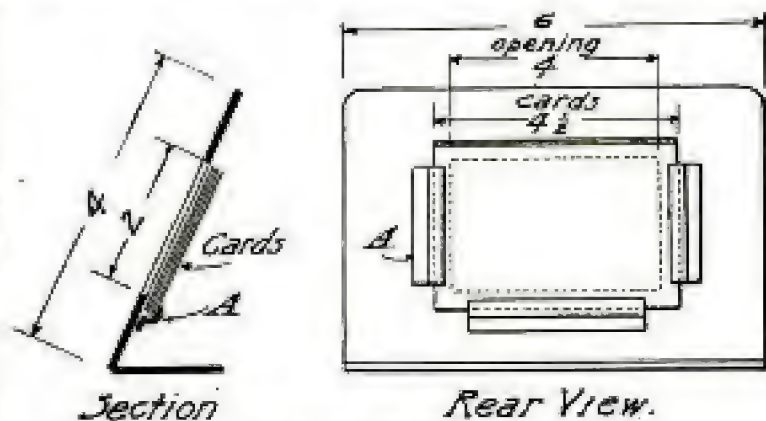
Those who do not care to take up the etching may make a very good desk set by adopting the hammered-copper or the brushed-brass effect throughout. The former is produced with the ball end of the

"ball-peen" hammer, and is accentuated by coloring and then rubbing the higher portions brighter. The brass effect is simply a matter of uniformly rubbing with emery cloth in the same direction, and is often termed "lemon" brass.

The reader, it is to be hoped, will not mistake our motive in showing so many different patterns and neglect to have each and every piece of his set harmoniously etched. The patterns already shown have been given considerable variety to serve as suggestions, but all the pieces of any one set should have a like motif running through all the designs of the several pieces.

Desk Calendars

The small calendar in the center of our illustration is a very simple affair;



Detail of Desk Calendar

a single piece of brass or copper is bent at an angle to form a base, and,

after etching some appropriate design on the upper portion, the pad from a small calendar is attached with shellac or varnish. This form of calendar may be made as small and dainty as desired, so we need give no dimensions.

In the other form of calendar illustrated, we have greater opportunity for artistic treatment. The sheet of metal should be about 6 in. square. Accurately lay out the rectangular opening in the center and then cut it out with a small metal saw similar to those used by jewelers. The purchase of this saw is not absolutely necessary at this time, as the opening may be cut with a cold chisel and finished with the file, or else it may be etched out; but such a saw must be procured before we reach the end of our series. After thoroughly cleaning the metal, transfer the design to it from the piece of paper upon which it has been previously drawn out in pencil. Paint out the not-to-be-etched portions, including the back and base, with the asphaltum paint, and then go on with the etching in the usual manner, using a photographer's developing tray. After some three or four hours, as required, remove, and clean off the paint with kerosene.

In order to hold the leaves or cards of the calendar proper, we must solder onto the back three bent strips as indicated at A in the working drawing. Bend these up from thin metal, and

then thoroughly scour them and the back with emery cloth. This brings us to the feature of soldering, which will prove surprisingly simple if gone about correctly. The art of soft soldering is one that has no end of uses among the various handicrafts and should be among the accomplishments of every amateur. The fluxing solution may be purchased, or made as follows: In a few cents' worth of muriatic acid dissolve as many pieces of scrap zinc as possible and then strain the solution, which may then be used to solder any ordinary metal, except aluminum. Some wire solder having been procured, moisten the two pieces to be joined with the above solution and place a few small pieces of the solder in position. If the metal is thoroughly clean and is now held over (not in) a gas flame, in a few minutes the solder will flow all through the connection. A soldering iron may be used instead of the flame, but the latter, or else a blowpipe, is the better way. Having secured these three strips to hold the cards, the face should be cleaned up and treated with either the darkening or verdigris solution previously described. The design is now to be accentuated by rubbing up the higher portions, after which a uniform coat of lacquer, or banana oil as it is sometimes called, should be applied to render the effect lasting.

NAVAL DRYDOCK USED AS THEATER

The huge drydock of the Puget Sound navy yard, at Bremerton, Wash., was recently converted into a theater for the entertainment of the crew of the cruiser "Colorado" and their guests. Two thousand enlisted men gathered on the big "altars" of the dock to see a motion-picture exhibition. The machine, owned by the crew of the "Colorado," was set up on a lighter at one side of the dock, and the audience was gathered along the other side.

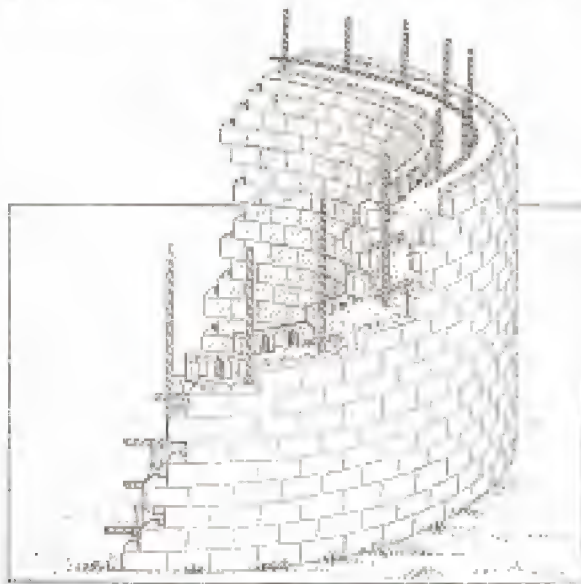
GAS-DRIVEN CARGO SHIP SUCCESSFUL

The "Holzapfel I," the first British sea-going cargo vessel driven by gas engines, has now been in service a sufficient period of time to demonstrate its success or lack of such. It has made about 10 voyages, carrying an average of about 325 tons of cargo each trip, the cargoes consisting of several materials, including granite from Guernsey to London, scrap iron from London to Llanelli, Wales, hardwood and cement from London to Cork, oats, chalk, lime, coke, etc.

Various adjustments of the machinery had to be made before the vessel was able to do regular and satisfactory work, but, as it was built for experimental purposes, this was expected. The voyages mentioned have been accomplished in a very satisfactory manner, and with an exceptionally moderate consumption of fuel. The coal consumed varies from 2,800 to 3,700 lb. per 24 hours, while it is claimed that steam-engined vessels of the same size and power consume more than double this quantity.

NEW CHIMNEY COMBINES BRICK AND CONCRETE

A new type of chimney construction, claimed by its designers to combine all the desirable and attractive features of the various types of chimney and eliminate all their objections, is shown in the accompanying illustration. The inner and outer walls of brick eliminate all the temporary forms and framing required in all-concrete construction, the inner wall of fire brick protects the concrete at every point from direct contact with the hot

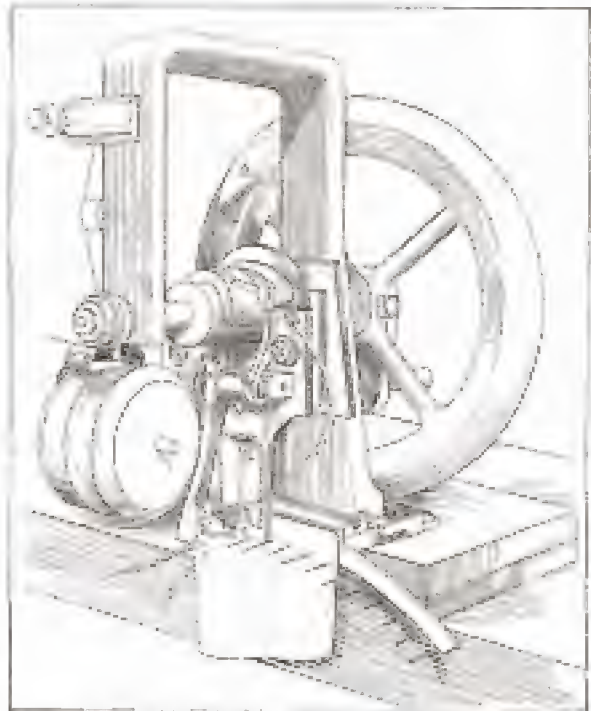


New Type of Chimney, Constructed of Fire Brick, Reinforced Concrete, and Pressed Face Brick

gases, and the outer wall of pressed brick makes possible the building of a chimney in accordance with any design or plan.

THE FIRST SEWING MACHINE

The unveiling of the monument erected in Spencer, Mass., to commemorate Elias Howe, the inventor of the



Courtesy American Exporter

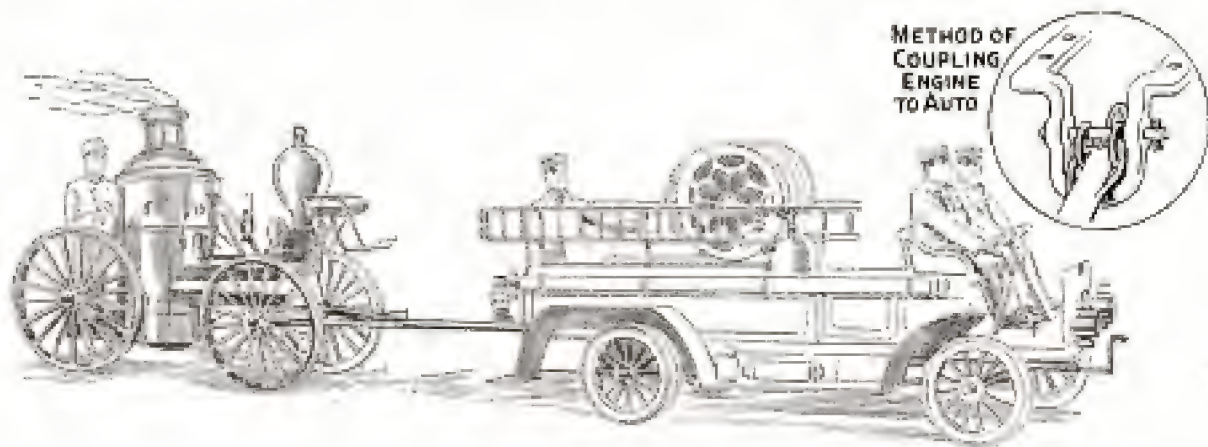
The Sewing Machine Invented by Elias Howe in 1845

sewing machine, draws attention to the difficulties he labored under before reaping a fitting reward for his ingenuity. At the time he devised his machine he was aged 26 years, was married and had three children, and was practically penniless, being chiefly supported by the labor of his wife with the needle. It is said that it was the distressing picture of his wife, who was rapidly falling a victim to consumption, stitching away through many hours of the night, that inspired him to devise a sewing machine. Anyway, he shut himself up in a little garret and after four months of application actually succeeded in sewing a seam with his machine. By lightly turning a handle, the machine was capable of rapidly and accurately running off 150 lock stitches in half a minute, while the average for hand stitching was only 15 stitches for the same period of time. The year was 1845.

The first work Howe did with his

machine, which is shown in the illustration, was to make two suits of broadcloth clothing, one for himself and the other for the owner of the garret, who purchased a half interest in the invention for \$500. A patent was taken out in 1846, in the joint names of the two owners, but 11 days after the patent was granted Howe was forced by his father, in return for the sum of \$1,000, to assign the other half of the patent to him in satisfaction of claims for small loans of money. Later he was forced to seek employment as a locomotive engineer, then went to England with his family in

hope of obtaining benefits from the machine in other countries. But meanwhile the English patent had been sold by his father and brother. He faced poverty for several years longer, his wife died, and in 1849 he returned to America completely destitute. Later, however, he succeeded, in regaining possession of the half of the patent turned over to his father, successfully fought the other concerns which had infringed upon his invention, purchased the other half interest, and began to reap a fortune. When he died at the age of 48, in 1867, his income amounted to \$200,000 a year.



Tongued Fire Engine Coupled to Motor Fire Truck

FIRE ENGINE DRAWN BY MOTOR FIRE TRUCK

In the gradual evolution from horse-drawn to motor-driven fire apparatus, now taking place in many cities of this country, the scheme shown in the accompanying illustration and now used in Milwaukee, Wis., may sometimes be utilized to advantage. By means of the coupling device shown in the right upper corner of the illustration, the tongued fire engine may be hitched to the rear of the motor fire truck, and the two make a fair speed.

Great Britain uses about 160 lb. of sugar per year per capita, compared with 80 lb. per capita in the United States. The per-capita consumption of tea in America is $1\frac{1}{2}$ lb., and in Great Britain about 6 lb.

METHOD OF DETERMINING CARBON IN STEEL

A means of correctly determining the percentage of carbon in various kinds of steel has recently been found by French scientists, who declare that combustion in oxygen under pressure gives the desired result. The method consists of burning the specimen in pure oxygen under suitable pressure to insure the complete combustion of both steel and carbon. Afterward the gases are drawn from the retort and the quantity of anhydrous carbonic acid therein is determined. Apparatus for conducting such an analysis has recently been constructed by two members of the French Bureau of Mines, and the method was described at a recent meeting of the Academy of Science in Paris.



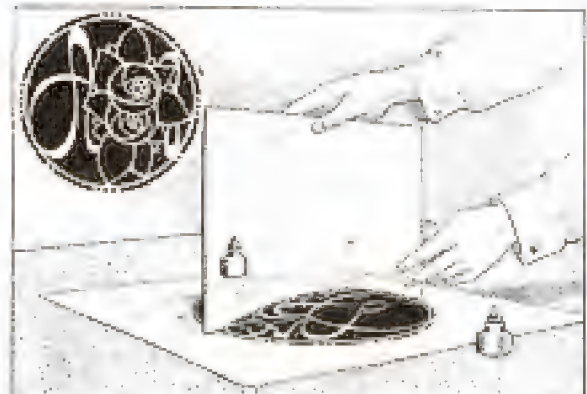
Fourteen Designs Formed from the Conventionalized-Rose Stencil Pattern by Altering the Position of a Mirror Set Vertically on Edge upon It

MIRROR EVOLVES MANY DESIGNS FROM ONE

As a purely mechanical assistant, yet one providing unlimited inspiration, the Upholsterer suggests an ordinary square glass mirror, maintaining that nothing else is of greater assistance and usefulness in the creation and adaptation of new forms. With such a mirror a few design motifs can be marshaled into hundreds of changes, geometrical, conventional, and fantastic, conforming with almost any required space or size.

Taking the conventionalized-rose stencil pattern, for example, the 14 patterns shown in the illustration were formed by simply holding the mirror in a vertical position over the rose design and altering its position. The usefulness of the mirror, however, is not confined to the mere chance development of symmetrical motifs. Its greatest usefulness is in the determination of corners or corner pieces for a given border. By placing the mirror at an angle of 45 deg. with relation to the outlines of a running border the

reflection as shown in the mirror will supply a second section at right angles to the original, while the edge of the mirror where it comes in contact with the original forms a corner of the pattern perfectly turned. By moving the mirror parallel with the border, still maintaining the 45-deg. angle, a perfectly balanced corner may easily be determined in harmony with the border itself.



Courtesy The Upholsterer

Conventionalized-Rose Stencil Pattern and the Method of Using Mirror to Form New Designs

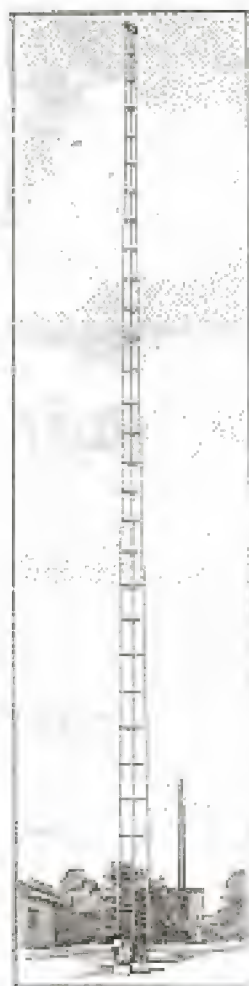
FOLLOW FOX HOUNDS IN AEROPLANES

Following the fox hounds in aeroplanes was a feature recently inaugurated by Robert J. Collier for the entertainment of 500 guests at his country home in New Jersey. When the hounds took up the scent in the drag hunt, followed by the horse-mounted hunters, Tom Sopwith, the English airman, and Al Welch, of the Wright

school, rose in their machines, and followed in the air, Mr. Collier and a photographer being the passengers. After a run and flight of several miles, Mr. Collier left the aeroplane, and, mounting one of his hunting ponies, led the chase across the hills and fields, with the aeroplanes flying overhead. The machine carrying the photographer often flew as low as 40 ft., while photographs were being obtained of the hounds and hunters below.

TELESCOPIC TOWER USED FOR PHOTOGRAPHY

A telescopic tower, designed especially for bird's-eye photography has been devised by a Worcester, Mass., concern. The light triangular tower is constructed in sections designed to give ample rigidity for holding an 11 by 14-in. camera steadily. When extended, the tower rises to a height of 125 ft., and when taken down, the sections telescope into a size sufficiently small to be conveniently shipped by freight or express. Apparatus is provided for raising, lowering, and holding the camera in the desired position at the top, and electricity is employed to operate the shutter in taking pictures. When the camera is drawn to the top by the pulley, it locks in position on the holder.



KILOWATT VS. HORSEPOWER AS UNIT OF POWER

The committee on units and notation, representing the German electrical engineering profession, has recently published several proposals for the improvement of electrical nomenclature. Some of these are in the direction of necessary and desirable standardization of practice, but one strikes us as being, although somewhat revolutionary, decidedly pertinent and important, says the *Electrical World*. This proposition is to abandon the time-worn and somewhat indefinite horsepower

for the kilowatt, which is just as good a mechanical unit as it is an electrical one. It is, in fact, the point of contact between the electrical and mechanical absolute systems. When the electric motor was new and totally unfamiliar to non-technical men it was reasonable to rate it as steam engines were, and are, rated in horsepower; but as time has gone on and the electric motor has replaced the steam engine to a very large extent, it seems like an obsession of conservatism to cling to an illogical unit of power bearing no simple relation to the modern absolute system and based upon ancient experiments never precise and possessing nothing more than historical significance.

The German proposition is to christen the kilowatt as a mechanical unit the "Neupferd" (the literal translation of which is "new horsepower"). This seems to us a totally unnecessary concession to an old-time blunder. The kilowatt, just as it stands and without change of name, is a perfectly good unit for mechanical purposes. We see no reasonable excuse for offering an apology in the way of a new name. To rate a motor in kilowatt mechanical output is an entirely simple and straightforward proposition and one that deserves very serious consideration.

It is an interesting bit of history, not in the least detracting from the merit of the German proposition, that the substitution of the kilowatt for the horsepower was vigorously advocated during and for some time after the Philadelphia electrical exhibition of 1884; and that the earliest of the three-phase motors built in this country were deliberately rated in kilowatt output. The time was, however, not ripe in the early eighties for dropping the horsepower, and the attempt later to put motor rating on the basis of the absolute system proved futile.

ⒸTunnel muck, taken from a pressure tunnel in Boston, and used as a concrete aggregate, showed greater strength than neat cement.

IMPROVISED LEVELING OUTFIT

An ingenious leveling outfit improvised by a plumber, who wished to make sure of the amount of excavation that would be necessary in a piece of work he was figuring on, is shown in the accompanying drawing. The ground in which the trench had to be sunk had several bumpy slopes. The outfit consists of a camera tripod on which was mounted by means of a screw-eye a 30-in. carpenter's level with globe sights. From the screw-eye hung a plumb, which served to establish the height of the level. In the suspended cord were three loops 3 ft. apart, marking the feet up from the ground, thus affording an approximate gauge by which to measure the level with the



Courtesy Metal Worker

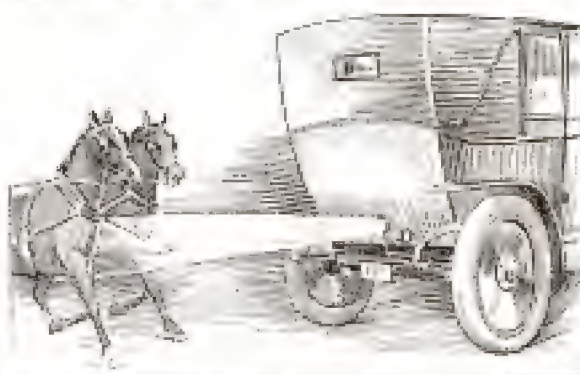
Leveling Outfit Improvised by a Plumber to Ascertain the Gradients of a Trench Line

tape from the instrument to the rod, by holding up on the cord according to the reading. The rod used had 2-ft. pocket rules fastened to it, the rules meeting at "instrument height," one reading 1, 2, 3 up, and the other 1, 2, 3 down. In his memorandum book the plumber entered the "down" figures under the plus stations, and the "up" figures under the minus readings, as preliminary work to a profile for determining the gradients of the line.

"FLASH" STOP SIGNAL FOR AUTOMOBILES

Many types of rear-end automobile signals are making their appearance on the market, and of these the type combining several offices, such as acting as a tail light, designating which way the

machine intends to turn, etc., seems to be the most practical. This device warns vehicles behind that the car is

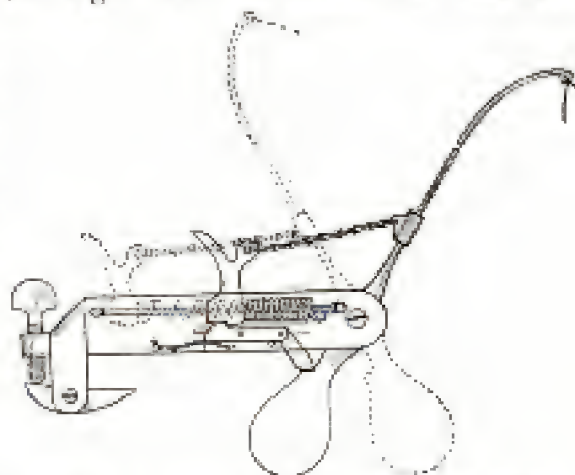


Combined Tail Light and "Stop" Signal

about to stop and also acts as a tail lamp. It comprises an electric signal light which is swung into an upright position from behind a red glass shield and by its sudden appearance gives warning of the contemplated stop. It is operated by means of a foot lever, and it acts as a tail light while behind the shield.

AUTOMATIC FISHING TACKLE

A fish-line holder used to quite an extent for stationary fishing in France is shown in the accompanying drawing. After the line is baited and thrown into the water, the hammer of the device is moved carefully to the right until its lower end engages



Method of Operating Automatic Fishing Tackle

the trigger. When the fish pulls, the pressure of the counterweight on the trigger allows the hammer to slide off

the trigger, and the spring, which is held contracted, extends and gives the line a swift jerk, calculated to hook the fish more solidly.

SECRETS IN RUBBER MANUFACTURE

It is often remarked that today there are no secrets in rubber manufacture, says the *India Rubber World*. The policy of the open door that the greatest and most progressive factories have long pursued, the constant interchange of ideas among foreign and domestic managers and superintendents, their visits one with another and their inspection of each other's plants would lead one to assume that there could be no private processes, no special machines—in a word, no secrets.

As far as the world at large is concerned, it is wholly secret. The manufacturers themselves, of course, have the basic facts of compounding, making up, and vulcanization in common. Beyond that, they become more or less individual in practice and often get exceedingly far apart. Here, therefore, is a fruitful field for secrets. For example, a manufacturer of conveyor belting for a specially hard service, experimented for two years to get a compound that would last the longest. By an amalgam of three kinds of crude rubber, by incorporating several ingredients in just the right proportion, and with a cure exactly fitted to the compound, he secured a result that was far ahead of what any other in the series could produce. He not only adopted this for his belts, but naturally guarded it very carefully.

A visiting brother manufacturer, although he stayed in the factory for a week, would have no knowledge of this compound. This is but one instance; there are thousands of others, big and little. They enter into cleansing, massing, compounding, calendering, making up, curing and finishing. Special secrets are in the possession of owners, chemists, mana-

gers, superintendents and foremen. Some are known to one only; others to half a dozen; still others to some branch of the trade, and so on. As the business grows, the old-time secrets become generally known in factories here and abroad; but so varied are the crude rubbers, and the compounding ingredients, so many users demand their own type of rubber product, that fresh secrets take their places. It is, therefore, no exaggeration to state that in matters vital the business of rubber manufacture is today even more of a secret industry than it was 20 years ago. That is why it does not profit those in the lead to take the whole technical world into their confidence.

DANGER FROM GAS-ENGINE EXHAUSTS

Investigators of the danger of exhaust gases from gas engines recommend to health authorities, according to *Engineering*, London, that the discharge of such gases into sewers be forbidden, and the discharge into any confined space to which persons have access be avoided. The effect of the gases on guinea-pigs and mice, under varying conditions of load, of air, and of gas supply, show that the gases are dangerous. With the engine fully loaded, the exhaust was free from poisonous gases, but was dangerous to human life owing to the large proportion of carbon dioxide and the absence of oxygen. When the air supply was sufficient for complete combustion, the exhaust contained up to $4\frac{1}{2}$ per cent of carbon monoxide, and was dangerous for inhalation when diluted with less than 50 volumes of air.

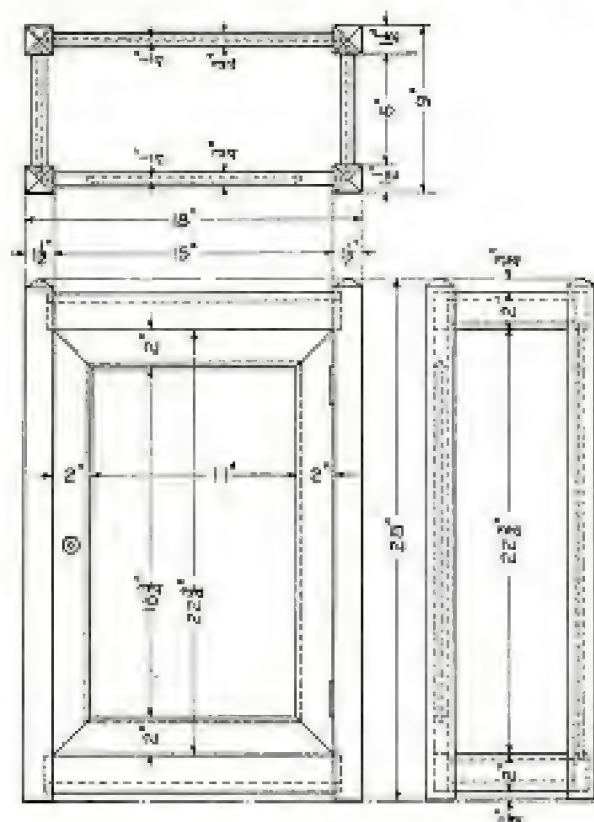
¶To promote the use of electricity in the homes, the electric company of the little German town of Lünenscheid, has installed slot machines by means of which consumers can purchase electric current in measured quantities as needed.

HOW TO MAKE A MEDICINE CABINET

This cabinet is best made of quarter-sawed oak as this wood is the most easily procured and looks well when finished. Order the stock from the mill ready cut to length, squared and sanded. The following pieces will be needed:

- 4 posts, $1\frac{1}{2}$ by $1\frac{1}{2}$ by 28 in.
4 side rails, $\frac{3}{4}$ by 2 by 46 in.
4 end rails, $\frac{3}{4}$ by 2 by 7 in.
2 door rails, $\frac{3}{4}$ by 2 by 15 in.
2 door rails, $\frac{3}{4}$ by 2 by 22 $\frac{1}{2}$ in.
1 door panel, $\frac{3}{4}$ by $11\frac{1}{2}$ by 19 $\frac{1}{2}$ in.
1 back panel, $\frac{3}{4}$ by 15 $\frac{1}{2}$ by 27 $\frac{1}{2}$ in.
2 end panels, $\frac{3}{4}$ by 6 $\frac{1}{2}$ by 23 $\frac{1}{2}$ in.
2 pieces for top and bottom, $\frac{3}{4}$ by 6 $\frac{1}{2}$ by 15 $\frac{1}{2}$ in.

Square the four posts and bevel the tops as shown. Cut grooves in them with a plow plane to receive the $\frac{1}{4}$ -in. panels. The tenons on the rails are cut $\frac{1}{4}$ in. wide and fit into the grooves in the posts the same as the panels. The rails have grooves cut at the inside edges for the panels. The front posts do not have grooves on the inside but have two mortises, one at each end for the top and bottom rails. The back



Details of Medicine Cabinet

has a panel fitted in the same as the ends. See that the pieces fit together

perfectly square and tight, then glue them together and give it time to dry.



Medicine Cabinet Complete

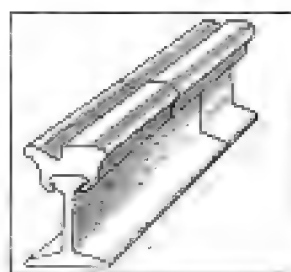
The top and bottom boards are next put in place. The top is placed in the center of the top rails, while the bottom is put even with the lower edge of the bottom rails, as shown in the detail drawing. The door frame is mitered at the corners and rabbeted on the inner edge to take the panel. A mirror can be used in place of the panel if desired. Suitable hinges and a catch, which can be purchased at a hardware store, should be supplied for the door.

The shelves are of soft wood and are to be arranged to suit the maker. Before applying a finish go over the cabinet with fine sandpaper and remove all the surplus glue about the joints and the rough spots, else the finish will not take evenly. The finish can be any one of the many different kinds supplied by the trade for this purpose.

It is estimated that 12,000,000 golf balls are used by the people of the United States every year, the value of which is set at \$6,000,000.

CHICAGO RAILWAYS TRY COMPOSITE RAILS

The two companies operating street railways in Chicago have each ordered composite rails sufficient for two miles of track, following successful working tests of this type of rail in England



and France. These rails, which will be used on curves and stretches where the traffic is heaviest, are rolled in two sections, lower and upper. The lower section has the appearance of a T rail with a small flat head, and is spiked or bolted to the ties in the usual way. The upper sections are then crimped or pressed on by a machine, and are superimposed in such a way as to break joints with the lower section.

The staggered joints of the composite rail make a smooth track, all fastenings are dispensed with, no fish-plates, bolts, angle bars, or sole-plates being required; no electrical bonding is necessary, and when the upper section is worn out, a machine cuts it off and crimps on a new top section, saving about half the weight of metal used in renewals, and, in the case of uncovered T rails, making other disturbances of the permanent way unnecessary. Where the rails are laid in streets and are covered to the level of the pavement, only 6 to 8 in. of pavement need be disturbed in renewals. As much saving as \$4,000 to \$5,000 is claimed for each renewal of a mile of such single track.

¶The jubilee of the establishment of the British postal savings banks has just been celebrated, the bank statements showing that while in 1861 there were 300 banks, now there are 15,000 with 8,000,000 depositors and \$800,000,000 in deposits.

TELEPHONE OPERATORS' EAR TROUBLES

That the ear troubles developed by telephone operators are due, not to any electrical or electromagnetic action, but to the "cracking" noise or the continuous series of sharp noises at regular short intervals, is concluded by Dr. Forster, of Charlottenburg, Germany. He suggests that special attention should be given the matter of developing a remedy, and recommends a type of telephone having a diaphragm of mica with an iron disk attached, in place of an iron diaphragm.

SIMPLE SEAL FOR SMALL PACKAGES

A new seal for small packages has lately been put on the market in France, which is believed to fill a need that has long existed and to bring forward a simple device for effectually and cheaply sealing packages that are not to be opened. The seal



New Seal for Small Packages, Used in France

consists of a small cylindrical box of metal, the lower part of which is provided with two holes to receive the two ends of the cord by which the package is tied. The cord is knotted in the box and the upper portion or cover of the box put in place. This cover fits tightly within the lower portion, its edges being provided with teeth that grip the knot. A pair of tweezers or pincers can be used to bring the two portions firmly together and when they are fixed the seal thus made must be broken before the cord binding the package can be untied. The use of the seal is not confined to small packages, of course, as it can be adapted to anything desired.

ESPERANTO RECOGNIZED AS A LANGUAGE

Esperanto, the international language, has been recognized by the United States Patent Office in a decision rendered in a case brought before the Patent Office by a trade-mark title company. This company, acting for a client, asked to have "saniga" registered as a trade mark, but the examiner held that these letters could not be registered because they form a word that is Esperanto for "sanitary." The case was then appealed to the commissioner of patents, who sustained the ruling.

In answer to the representation of the trade-mark company that Esperanto is not a language, the commissioner of patents quoted from the latest editions of the encyclopedias to show that it is recognized as an international language. The trade-mark law prohibits the use of a word that is descriptive as a trade mark.

OBSOLETE TORPEDO BOATS AS PRACTICE TARGETS

The British Admiralty is planning to use a number of old 60-ft. torpedo boats as targets for night practice. The work of converting these boats into targets consists of erecting canvas and wooden structures above the decks to represent funnels and deck-houses, and filling the holds, which are completely cleared of mechanisms and furnishings, with cork, etc., to render them unsinkable. Towed at varying speeds and angles of bearing, these targets will be made to simulate conditions presented by the approach of high-speed modern torpedo boats at night attacks, and will enable crews to acquire proficiency in repelling such attacks.

PAINTING IN TRIANGLES, SQUARES, AND CUBES

The paintings of a group of artists in Paris called the "Cubists," because in the work done by them pictures cease to be just pictures, becoming parallel-



An Example of the Art of the "Cubists"

ograms of color, triangles, squares, and cubes, are attracting interest in the European art world. The work of these painters occupied an entire room in the autumn exhibition in Paris, but the general tendency of the critics is to scoff. An example of cubism done by Auguste Herbin, one of the foremost members of the new school, is shown in the accompanying illustration. It is called "A Family Party."

IMPROVED DREDGER FOR GOVERNMENT WORK

The new dredge being built for the engineer corps, U. S. A., to be used for dredging the southwest pass of the Mississippi River, has several interesting features, and is claimed to be the first of its type constructed in America. It is to be named the "New Orleans," has a length of 315 ft., a breadth of 50 ft., a depth of 26 ft., and will dredge to a maximum depth of 50 ft.



Government Dredge Being Built for the Southwest Pass of the Mississippi

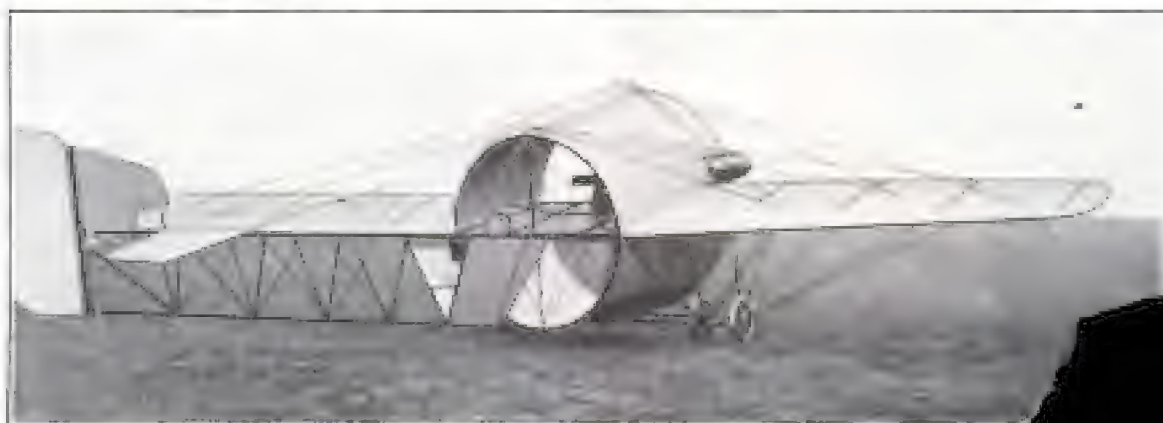
The most interesting feature of the vessel is the new type of dredger head. This is practically a huge inclosed rake, about 18 ft. wide, serrated along the edge with sharp cutting teeth through which water is ejected at high pressure. The discharge of water disintegrates the soil and makes it of suitable consistency to be sucked through the pipes into the pumps. The pumps discharge into the hoppers, which have a capacity of 3,000 cu. yd., and can be filled in 30 min. Should it be desired to utilize the dredged material for reclamation work, a swivel discharge pipe on the deck may

be coupled up with the necessary shore piping, the dredge discharging its own cargo by sucking it from the hoppers and ejecting it through the piping.

THE NEW JOURDAN MONOPLANE

As an example of how far wrong the aeroplane builder can go, if not possessed of sufficient engineering knowledge, this new French monoplane is characteristic.

The supporting and controlling surfaces are all of conventional form and



A "Freak" Aeroplane of French Design

are well arranged, for which reason there is no occasion to suppose that they will not sufficiently serve their purposes.

A freak element, however, is the center inclosure, which is in the form of a hollow truncated cone, and is dictated by the erroneous supposition that it is needful to hold together the air blast from the propeller, to keep it from diverging. But, as a matter of fact, even without such an inclosure as that shown in the illustration there is no tendency whatever for the air to spread with a properly designed aeroplane propeller, when the same is in normal action; so such a construction as this simply adds to the forward resistances and to skin friction, besides probably exerting a detrimental effect upon stability without the return of any compensating advantage.

CONCRETE CAISSONS USED IN KOBE HARBOR

Reinforced-concrete caissons have been sunk in Kobe harbor, Japan, to support the quay walls being constructed as part of the extensive harbor improvement. The bottom of the harbor has a stratum of soft mud to a depth of 6 ft., and considerable difficulty was anticipated. The caissons were built on shore and then set in place by means of a floating depositing dock.



Sinking Reinforced-Concrete Caissons in Kobe Harbor, Japan

ELECTRIC LETTERS FORM WINDOW DISPLAYS

Illuminated price marks and announcements for window displays will become the vogue in mercantile establishments, if a device recently brought out in Chicago comes up to the claims of the inventors. This consists of a system of electric letters, 3 in. high, which are really miniature incandescent



One of the Electric Letters lamps set on individual porcelain bases and so arranged that they can be placed together to form any desired collection of letters or figures. The letters are formed of glass tubes, $\frac{1}{2}$ in. in diameter, small carbon filaments



The Word "Ruth" Formed in Miniature Electric-Display Letters

being sealed in the tubes in the same manner as incandescent bulbs are sealed. A metal stand is provided any length desired and each letter, figure, or space base is provided with metal tongues and grooves to fit into one another and form the necessary contact with the electric current. The lamps are made to be used with the ordinary lighting current, a connecting cord for which is supplied. It is estimated that the lamps will burn as long as the average carbon-filament electric light, and, as stated, they can be used over and over again to form an endless variety of words or phrases.

Orange-colored spectacles to protect the eyes of wireless operators from ultraviolet rays in the sparks have been placed on the market in France.

THE "HOOP-HOBBLE" IS THE LATEST

Among the new dress creations from Paris is an example of "frenzied dress-making" called the "hoop-hobble." It



The Paris-Created "Hoop-Hobble" is the Latest Example of "Frenzied Dressmaking"

is designed to please both those who favor the revival of the voluminous crinoline and those who prefer to retain the skimpy hobble skirt. The crinoline part of the unique costume is of white tulle, and the hobble skirt is of embroidered white satin. The stiffened black-velvet edge of the former keeps it "ballooning."

A YEAR'S OUTPUT OF STAMPS

The Government Bureau of Engraving and Printing delivered 10,131,069,000 perfect postage stamps during the last fiscal year. The paper required for this work amounted to 1,000,000 lb. and to make this paper 4,000 large pine trees were ground to a pulp. Had these trees been converted into lumber, 75

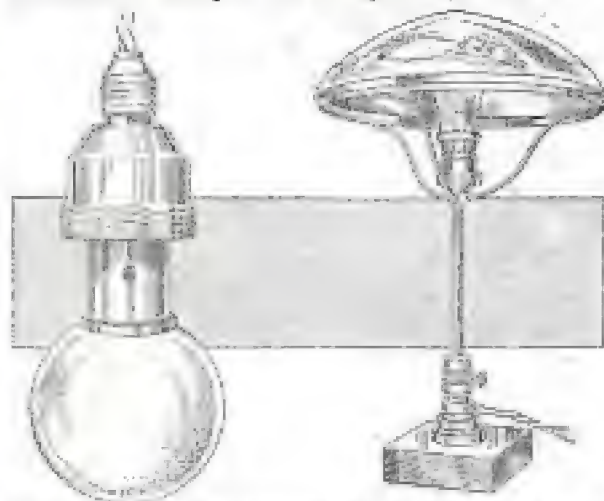
well appointed bungalows could have been built. The paper itself would make an edition of 3,000,000 12-page, 7-column papers.

As the stamps were printed from intaglio-engraved plates in which the entire surface is covered with ink and wiped with a cloth that leaves the ink only in the engraved lines, the amount of ink required was 387,500 lb. But only 10 per cent of this was actually applied to the stamps, the balance being wiped off. The gum on the back of the stamps is made by scientifically roasting the highest grade of tapioca starch such as is used for making pudding, and as 325,000 lb. were used, all of the inhabitants of a large city would have been given their fill of tapioca pudding for one meal with the material used.

The sheets of 100 stamps each, as sent to the postoffices, piled upon each other, would make a shaft over 6 miles high, and placed end to end would make a strip 15,000 miles long; and as there are 10 rows of stamps in each sheet, a strip of single stamps would be 150,000 miles long and would girdle the earth 6 times, with something over.

INDIVIDUAL TRANSFORMERS FOR LOW-VOLTAGE LAMPS

With a tension or pressure as low as 14 volts, it is possible to employ cheap and exceptionally durable metal-filament lamps of 5 cp. and upward



The Tiny Transformers may be Noted at the Top of the First Fixture and the Bottom of the Second

with economy, as the filaments of such low-voltage lamps are short and thick. In utilizing such lamps, however, a transformer has to be used to reduce the ordinary line voltage, and a German concern has now placed on the market a complete line of tiny transformers sufficiently inexpensive to allow their being fitted to each individual lamp. They are very compact, and when screwed into the socket just ahead of the lamp, appear to be nothing more than a slight enlargement of the lamp base.

SANTA CLAUS IN AN AEROPLANE

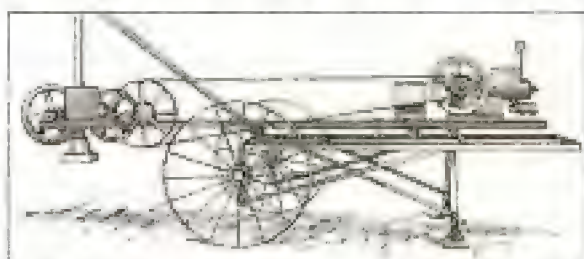
An excellent idea for the Christmas season, especially in connection with Christmas festivities in the Sunday school, is here shown. Santa Claus arrives in a snow-covered aeroplane, steps out onto the roof of the miniature cottage and descends into the fireplace. The idea, as shown, was carried out in the Methodist church at Wyoming, Ill.



Santa Claus Arrives in an Aeroplane, Steps Out onto the Roof, and Enters the Miniature Cottage through the Chimney

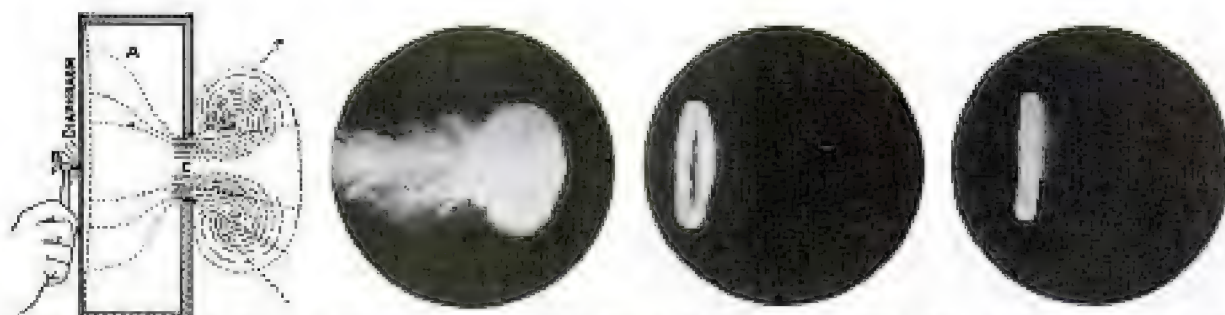
TAMPING BRICKS WITH POWER MACHINE

A motor-operated machine for tamping bricks in laying pavements, and also for tamping down the earth when



Tamping Bricks with a Motor-Driven Machine

trenches for sewer, water or gas mains are being refilled, is here shown. The tamper is mounted on one end of a sweep and the gasoline motor on the other, the sweep being mounted near its center of gravity on a saddle casting which has a bearing on the truck axle and swings in a horizontal direction on this pivot, thus moving the tamper across the work as the blows descend. The tamper strikes from 50 to 60 blows per minute, the length of stroke being 2 ft., and the weight of the head, 80 lb.



Projecting the Fluid Rings—The Drawing on the Left Shows the Operation of the "Gun," and Manner in Which Rings are Formed: Box A, Containing Colored Solution, is Struck by Hammer at Diaphragm B, and Fluid is Forced Out of Opening C, with Whirlpool Motion, Which Creates Ring—Other Views Show Progress of Ring

SOME REMARKABLE EXPERIMENTS WITH LIQUID RINGS

Every tobacco smoker has pondered over the curious and complicated movements seen in rings of smoke and has wondered at this tenacity of form and motion. Their study has not been entirely reserved to the saffron-tinted imaginings of the users of nicotine, however, for locomotives furnish some of the most perfect examples of ring motion, or vortex motion, as the scientific investigators term it.

Probably no other profound and abstruse subject has attracted so many experimenters, for its scientific side has been considered of great importance for many years.

Not wholly unlike acrobats at a circus, animated rings in fluids move according to known rules and mathematical formulas, and in their strange movements may be hidden the great cosmic secret, the constitution of matter.

The eminent German physicist, Von Helmholtz, first made a vigorous mathematical investigation of the movements and properties of vortices, whirling rings, about 50 years ago. Based on his work, Lord Kelvin developed his famous vortex theory of matter. In this theory he assumed that atoms were really vortices in the all-pervading ether. Since the discovery of radium, this theory has been supplanted by the electron theory, and at this time some thought is being given to a possible combination of both theories as being the true cosmic scheme.

Professor Tait translated the work of Von Helmholtz and illustrated it by a series of clever experiments. He gen-

erated rings of ammonium chloride, a gas, by means of an ingenious arrangement that allowed considerable control of the size and velocity of the rings. It was found that the rings possessed many of the characteristics predicted by Von Helmholtz. They moved in a line at right angles to the plane of the ring and each carried with it the same material with which it issued from the generator. When projected slantingly against some solid object, or even other rings, they were thrown into violent vibrations just as though they were of rubber. If one ring overtook another, the more slowly moving ring would accommodately open up and allow the second ring to pass through it. Then the slow ring would acquire more speed and in its turn pass through the ring ahead.

The theory of vortex motions considers the movement of vortex rings in a perfect fluid. A perfect fluid is assumed to be incompressible and without viscosity, or frictionless. Water is a much more perfect fluid than air and Professor Edwin F. Northrup of Princeton University has just concluded a most interesting line of experiments on liquid rings traveling in water.

The apparatus used was very skillfully worked out. A tank with wooden bottom and ends, and plate-glass sides, was made, about 5 ft. long, 2 ft. deep and 3 ft. wide. The "gun" from which the rings were projected into the water was placed under the surface at one end. It was so held that its direction could be accurately adjusted

and consisted essentially of a brass tube 3 in. in diameter. On the discharge end was a removable brass disk, provided with an orifice of the size and shape of the ring desired. The other end of the tube was covered with a metal diaphragm. An electromagnet was so arranged as to strike a sharp blow on the diaphragm. It was essential that rings be produced that would be of strong color while they endured and that would not change the color of the bath when broken up. In order to make red rings, an acid bath and an alkaline ring solution was used. White rings were made by preparing an emulsion of silver chloride in gelatine. This gives a smooth milk-white solution which will not settle and has the property of becoming entirely colorless in a weak solution of ammonia. The rings were observed through a lens set in the end of the tank opposite the gun. It was found that the rings were about one and a fifth times the diameter of the orifice through which they were discharged. As they came near to the opposite end of the tank they expanded to several times their original diameter before breaking up. They travel in straight lines with a gradually diminishing velocity. The proof that the same material constituted the body of the ring in its journey, is, that strongly alkaline rings would travel through a strongly acid solution for over 3 ft. before being absorbed.

Indian meal was sifted into the water in the path of the rings but it was found that the rings passed through and among the particles but took none of them along.

A frame covered with chiffon cloth placed in the path of the ring had no effect, the ring passing through it unaltered. If a frame covered with tissue paper was similarly interposed, the ring would break through the paper like a circus rider through a hoop, but was itself broken up and destroyed.

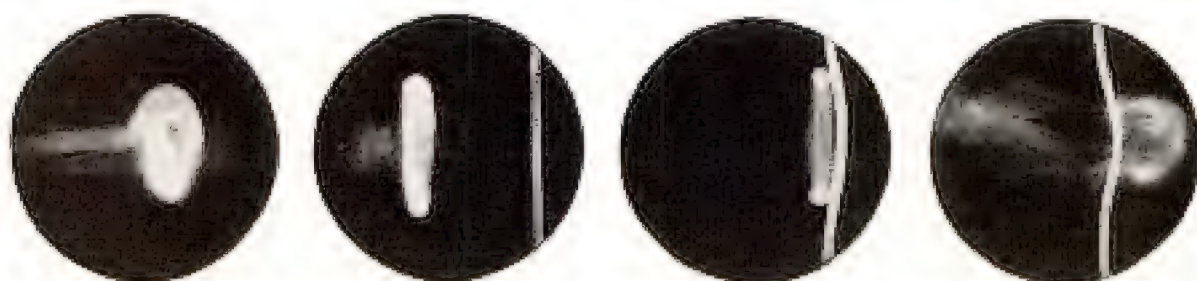
If a light watch chain was hung in the bath in the course of the ring, it was bent into a decided curve by the force of the blow.

If two "guns" were discharged simultaneously from opposite ends of the tank and the rings met fairly, they were broken up. But if they were so directed that the edge of one might be expected to meet the edge of the other, each bent out of its direct course and they passed without touching.

When the "gun" was tilted so as to shoot a ring toward the surface of the water, it was very beautifully reflected. On nearing the surface, the upper side of the ring gained in velocity so that the plane of the ring was always at right angles to the line of travel.

The angle at which it struck the surface was also equal to the angle at which it was deflected, thus following the law of light, the angle of incidence being equal to the angle of reflection. There was, however, a critical angle beyond which the ring was not reflected but jumped out of the water with a spurt.

If the tank was half filled with a dense solution of barium chloride or common salt, and the upper half with water and a ring discharged at a gentle angle toward the surface of the heavier solution, its course was observed to bend downward in the denser solution



Photographs of Ring Approaching Chain Suspended in Water—Note How Ring Forces Chain Forward in Third View, and Finally is Dispersed by the Chain as It Passes On

just as a ray of light is refracted on passing from air into water.

Rings discharged from elliptical openings maintained an elliptical form but with a rapid vibratory motion.



Stages of Junction of Two Rings Forming a Single Ring

The vibrations were such that the ellipse had its greater diameter first vertical and then horizontal, these changes in form following each other so rapidly that the eye could barely follow them.

When two rings were discharged from the "gun" at the same instant, through a disk provided with two holes, they began to attract each other as soon as they left the "gun" and came together with great suddenness, forming one ring of double the circumference of a single ring. These combined rings also had very interesting vibratory movements.

In another experiment the surface of the water in the tank was covered to a depth of 4 in. with kerosene, colored deep red. A ring was discharged at an angle toward the surface. On entering the oil, the water ring immediately became an oil ring, was reflected from the surface of the oil, and re-entered the water as an oil ring,

continuing until broken up at the end of the tank.

When no coloring matter was used in the "gun," the water ring was invisible when it entered the oil and the illusion was produced of a red oil ring issuing from the oil without any cause. It was also found that an oil ring could be generated in the gun and projected through the water the length of the tank, but rings formed from solutions heavier than water were unstable and at once broken up.

An earthenware jar was half filled with cold water. The top half was carefully filled with hot water. The ring gun was charged with hot paraffin and discharged vertically downward into the hot water. Paraffin rings were thus formed in the hot water and as soon as they reached the cold water they became solidified, forming, as it were, solid vortex rings.

The photographs were taken very ingeniously. All exposures were double and simultaneous so as to get stereoscopic views. Light was furnished by a powerful electric spark enduring from $1/32,000$ to $1/50,000$ of a second. Two electric flashes, one for each plate, were produced at exactly the same instant and were so regulated as to repeat several times at intervals of $1/80$ th of a second. The two sensitive plates were exposed while falling through guides. They were adjusted to fall at a speed that would equal the diameter of the exposure every $1/80$ th second. Thus on some of the long plates several exposures were made, as many as 3 or 4, if the rings were in range.

A CONCENTRATED HOME—FOUR ROOMS IN ONE

A Cincinnati man has produced what might be called the quintessence of intensified living—a four-room-and-bath apartment confined within the space of one room of ordinary size, each room of which is completely equipped and furnished with those things characteristic of living room, dining room, kitchen and bed chamber.

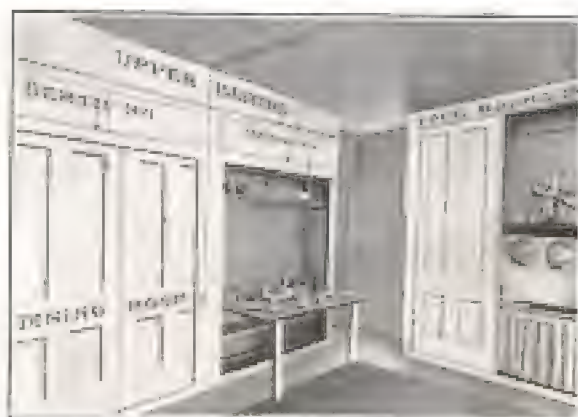
Further than this each room is exactly the same size as the one-room space which includes all four. This is not a puzzle or a catch design but a genuine specimen of the application of ingenious mechanics to the perplexing problem of reducing housework to the smallest possible amount of space.

To be exact, there is only one fairly



The Kitchen, Showing the Gas Stove Behind the Sliding Door

large-sized room in the apartment. It is furnished with four hollow walls that do the trick of transformation when properly manipulated. The walls are provided with sliding partitions with a deep space between them and the actual walls of the building or house partitions. Each of the four partitions represents a room and behind each is the equipment for the room it represents. Thus in the morning the sliding back of doors on one side brings into view a gas stove, ice chest, provision closet, folding table, which is let down into the room, a sink with hot and cold water and all other things necessary for a kitchen. Breakfast cooked, the partitions in another wall are manipulated and a sectional dining-room table is brought forth—a table large enough to accommodate 12 persons. There is also a china closet, chairs and a sideboard or buffet. The living-room furniture behind another section of the parti-



The Dining Room Revealed, with One Section of the Dining Table in Place

tions includes a couch, library table, reading lamp, easy chairs, etc. As each room is used, its furnishings are put back in place again to make way for the next room. A bed, bureau and washstand with running water, with the bathroom, are concealed behind the fourth partition in the same manner as the other equipment.

The owner and designer of the "concentrated" home rather resents the imputation that he has turned out a freak. He insists that the construction of a one-room four-room apartment is a perfectly natural solution of the servant problem. With all four rooms concentrated in the space of one there is just one-fourth of the housework to do that would fall to the lot of the housekeeper in an ordinary apartment.

Acetylene torches for use in dense fogs have been supplied the police of Paris.



Bed Chamber Ready for Occupancy—Folding Bed Prepared for the Night



Commissary Department, Showing Ice Chest, Provision Closet, and Sink

A MISSION PLATE RACK

The plate rack shown in the accompanying illustration is designed for use in a room furnished in mission style.



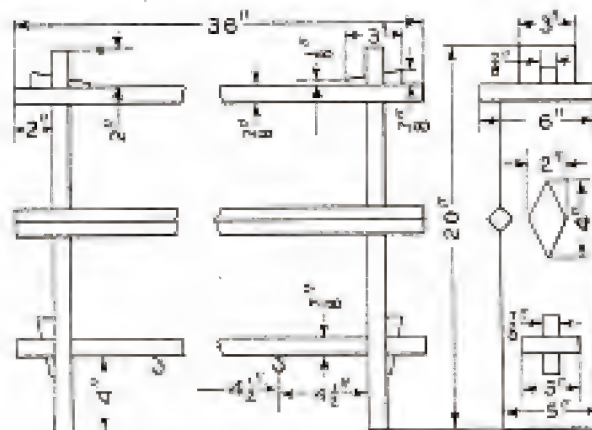
Finished Rack

The dimensions may be changed to suit the wall space. The parts are held together entirely by keys. The bar across the front is for keeping the plates from falling out, but this may be left out if the plates are allowed to lean against the wall.

The following list of material will be needed, and, if the builder does not care to do the rough work, the stock can be ordered planed, sanded and cut to the exact size of the dimensions given.

- 2 ends, $\frac{3}{4}$ by 5 by 20 in.
- 1 top, $\frac{3}{4}$ by 6 by 36 in.
- 1 shelf, $\frac{3}{4}$ by 5 by 36 in.
- 1 bar, $\frac{3}{4}$ in. square by 36 in.
- 4 keys. Scrap pieces will do.

Lay out and cut the mortises on the end pieces for the tenons of the shelf,



Detail of the Plate Rack

also the tenons on the top ends and the diamond shaped openings. In laying

these out, work from the back edge of the pieces. Cut the tenons on the ends of the shelf to fit the mortises in the end pieces, numbering each one so the parts can be put together with the tenons in the proper mortises. Mark out and cut the mortises in the top to receive the tenons on the end pieces.

In laying out the mortises for the keys allow a little extra on the side toward the shoulder so the ends and top may be drawn up tightly when the keys are driven in the mortises. All the mortises and diamond shaped openings should be marked and cut with a chisel from both sides of the board.

If the bar is used it may be attached with a flat side or edge out as shown.

Finish the pieces separately with any weathered or fumed oak stain. When thoroughly dry, apply a very thin coat of shellac. Finish with two coats of wax. The rack can be attached to the wall by two mirror plates fastened on the back edges of the end pieces.

BATTLE MONUMENT TELLS
STORY OF TREASON

Although the great granite monument at Schuylerville, N. Y., was erected to commemorate the battle of Saratoga and the surrender of Burgoyne in 1777, it likewise serves as a strange reminder of the traitor, Benedict Arnold. The monument is 155 ft. high and has a base 40 ft. square. On each of the four sides of the base is a niche. Three of the niches hold the statues of General Gates, General Schuyler, and General Morgan, but the fourth is vacant. It would have held the statue of Benedict Arnold, who, in a spectacular sortie with his force in that battle, broke through Burgoyne's left wing, had he not later become a traitor. The people who see the monument, notice the vacant niche, and, if they do not know the story, ask the reason.



Front View of Whale Which Came Ashore at Ocean City, N. J.

HUGE WHALE COMES ASHORE AT OCEAN CITY

Early one morning recently a surferman sighted a whale about 500 yd. off shore at Ocean City, N. J., making more or less of a commotion. A short time later it landed in shoal water,

turned over on its side, and died. The huge whale was of the sperm variety, seldom seen so far south.

It is computed by medical men that there are in this country an army of 3,000,000 invalids, half of whom are afflicted with preventable diseases.



The Big Mammoth Viewed from the Other Direction

LUMINOUS SIDEWALK SIGN

A method of setting a luminous sign in a sidewalk is shown in the accompanying illustration. A pit for the



An Idea for Luminous Sidewalk Signs

electric lamps is cut in the sidewalk and is covered with a thick slab of glass bearing the lettering of the sign.

NEW TYPE OF ARMOR PLATE

Since the days of the "Merrimac," naval warfare has largely resolved itself into a grim contest between shell-resisting armor and armor-piercing shells.

Beginning with strips of wrought iron laid over the most vital parts of a ship, of which the "Merrimac" was a crude example, this scientific duel produced next a compound armor plate—wrought iron faced with steel; and

three solid steel plates. These were followed by plates of an alloy of nickel and steel. Then followed the Harveyized plate and finally the present standard, the Krupp plates, with which all the great battleships of the world are protected.

On the other hand, it is conceded that the heaviest plate in use, if struck fairly by a modern projectile such as are now in general service, will be readily penetrated. This condition has heretofore always resulted in the production of an improved armor plate, and the signs are that the new plate is about to arrive, if it is not already a reality. It is barely possible that some one, or perhaps more, of the great powers possesses and has used for some time the secret so many are seeking out.

Metallurgists have been devoting much time, money and experiment to the various new alloys of steel, such as vanadium, nickel-chrome, nickel-tungsten, etc., in this connection. So far as known the most promising development is the Simpson weld, which has recently been announced in some detail.

Mr. W. S. Simpson, about three years ago, found that when two plates of steel, separated by a thin sheet of copper, were packed in a mixture of carbon, brown sugar and water, tempered to the consistency of compressed snow, and the whole mass subjected to a constantly maintained temperature of 2,000 deg. F., for a considerable number of hours, a perfect weld was made between the steel plates. Sections of the weld have been microscopically examined by Prof. J. O. Arnold of the University of Sheffield, and he states that the copper is dissolved into the steel and becomes molecularly continuous with the steel itself. No trace of the copper remains visible, and the weld is considerably stronger than the steel itself.

The ideal armor plate must, in a general way, possess two characteristics: First, a steel face of sufficient hardness to stop and destroy the heaviest, hard-

est, highest-velocity projectile; second, a backing of the toughest, most tenacious steel obtainable.

A plate made of high-speed tool steel would answer the first requirement, but would have a strong tendency to shatter, being as brittle as glass. This would expose a large area to succeeding shots, besides being dangerous to the men on board on account of the flying pieces. A tough steel plate, on the contrary, is readily penetrated, but does not crack or shatter. The projectile makes a round, smooth hole through it no larger than its own diameter. A combination of these features—the hard destroying face and the easily punctured, but unbreakable backing—will afford the desired result. The Krupp process—merely a mode of casehardening—is an attempt in this direction. But, at best, it does not afford a greater depth of carbonization than $\frac{7}{8}$ in.

It is proposed to join together by means of the Simpson weld a face, say, of high-speed tool steel of any desired thickness and a soft-steel backplate; and this combination would, no doubt, give an immense advantage.

Experiments have been made, it is said, with plates of regulation size, composed of 2 in. of hard steel and 4 in. of soft steel welded together. These plates gave very satisfactory results when attacked by a 6-in. gun. It has also been stated by an authoritative naval publication that while Krupp armor has 50 per cent higher resisting power than Harveyized armor, the Simpson armor has a resistance 75 per cent higher than the latter.

RAILROAD TRACK WITH CONCRETE TIES

In order to give a thorough working test to the possibility of substituting concrete ties for the wooden ones now in use, one railroad has built a spur on its line in West Philadelphia, using concrete ties exclusively. The rails are fixed in place by a patch of concrete when the metal has been fixed to the



Experimental Spur Track with Concrete Ties

ties. This patch, placed either side of the rail, seals it when the concrete dries. The ties are claimed to be practically indestructible. This, of course, makes the method much cheaper than the wooden tie, which has to be replaced frequently. Whether or not the concrete tie is superior to the wooden one from other points of view, as for instance, when the metal expands with the heat or contracts from cold, are matters that the present experiment is intended to decide.

BIPLANE HAS MICA WINDOW

One of the new Voisin biplanes, designed for military purposes, is provided with a mica window, enabling the pilot to see what is happen-

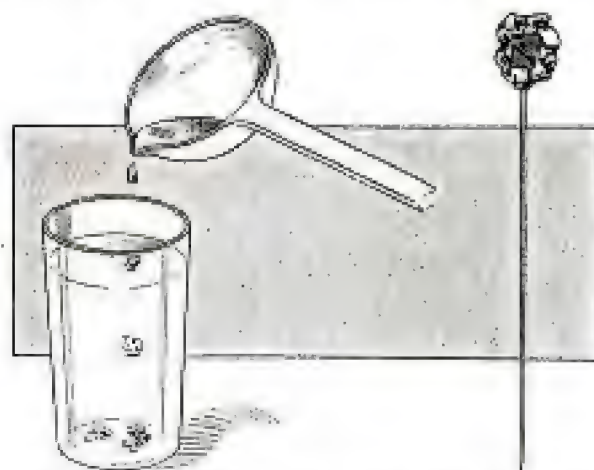


Mica Window Enables Airman to See below Him

ing below him without altering the angle of his planes or having to stretch from his seat in order to see over the forward part of the fuselage.

FORMING JEWELRY SHAPES BY POURING IN WATER

A method of producing irregular-shaped pieces of metal to be soldered



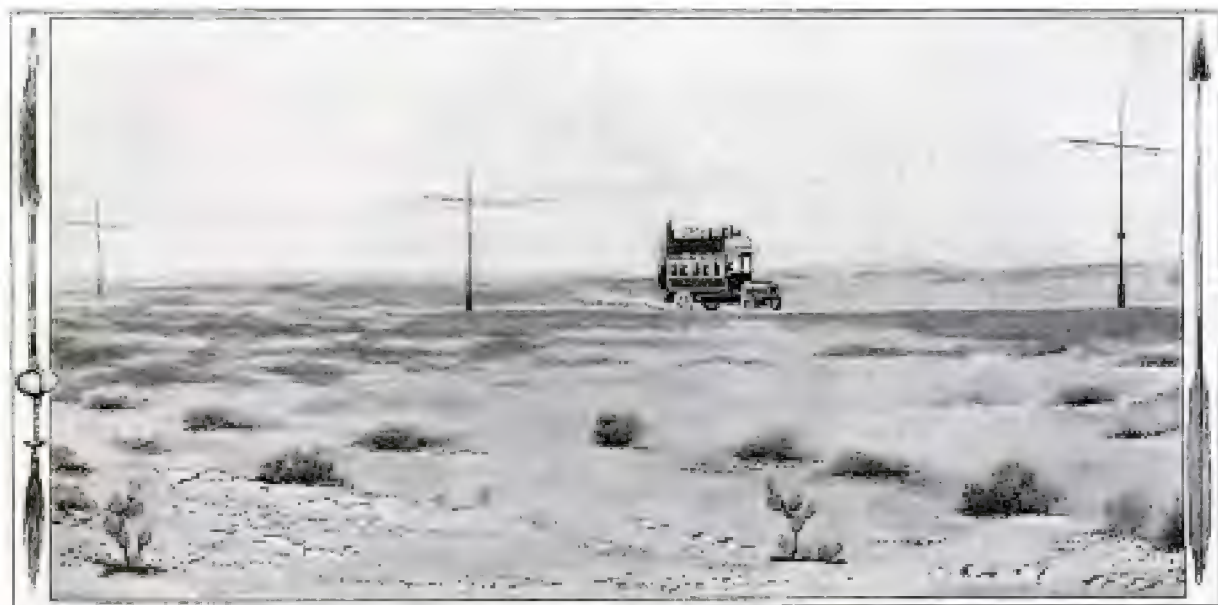
Dropping Melted Silver or Gold into Water to Produce Irregular Pieces of Metal, and a Scarf-Pin Thus Formed

together in the form of scarf-pins, etc., has been patented by a Baltimore concern. The irregular pieces of metal

are formed by dropping melted gold or silver into water. It is stated that the soldering causes a discoloration of the portion near the solder, while the other portions of the gold or silver retain their natural color, thus producing a variegated article having a pleasing appearance.

STEWED BLUEBERRIES AN AID TO SURGERY

The eating of stewed blueberries, blueberry pie, or blackberry jam as an aid to certain forms of surgery has recently been demonstrated when such simple means were called into service to assist in removing a fish bone that had become lodged in the throat of a patient, but was not easily found because its color made it almost invisible. The patient in question was required to eat some stewed blueberries. The juice of the berries colored the fishbone and made it easily distinguishable. Since then it has been found that this staining method has been most effective in a number of similar cases and that any fruit like blueberries or blackberries would give the required stain.



A motor omnibus is now running between Heliopolis and Cairo, Egypt, and although the Arabs continue to look upon it with great astonishment, an increasing number of them are traveling between the two ancient cities on the "mechanical camel."



Distinctive Types of Aerial Helmets

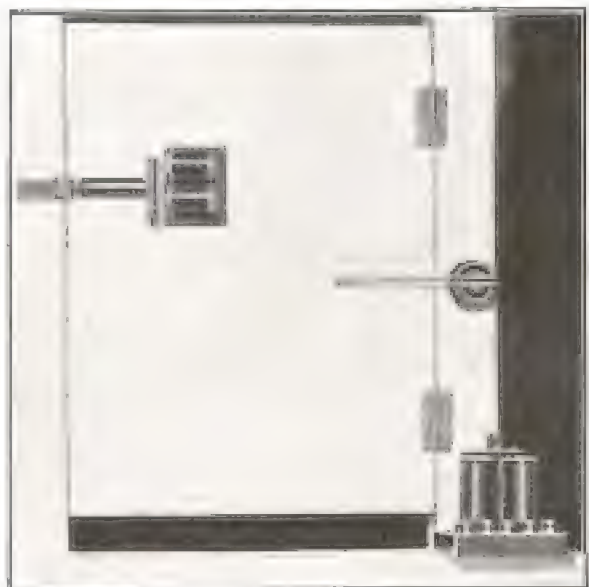
FASHIONS IN AERIAL HEADGEAR

The different types of headgear adapted for the special needs of air-men is exceptionally large, considering the limited number of men flying,

and is continually growing. Eight styles used by eight well known flyers in Europe are shown in the accompanying illustrations.

A DOOR THAT OPENS TO A WHISTLE

Burdened with the necessity of having to rise from his bed to unbolt the bedroom door so that his breakfast could be brought in, a Londoner has invented a door which opens to his whistle. This is accomplished by means of a simple electromagnet which draws the bolt when a current passes through it, a platinum point, and a piano wire attuned to a certain note. By sounding this note or one of its octaves, the wire vibrates in response, and this vibration brings it in contact with the platinum point, thus completing the circuit and bringing a very sensitive relay into operation. Instead of a tuning fork, a sounding drum of



A Model of the Door Which Opens When a Particular Tune is Whistled or Sung

any kind may be used when it is necessary to open the door while at a distance, the drum being made to emit the particular note required through a microphone connected telephonically with a mouthpiece. Or a gong or bell of the correct pitch may be used.

The Londoner who devised the door is the scientific expert of the London Daily Mirror, and this publication, in reciting the humorous possibilities of the idea, suggests that before many years such reports as the following may be read every day:

STRANGE OCCURRENCE.—A respectable elderly woman was found wandering along — street in great distress last night. She explained that she had just moved into a new house, and having gone out for her evening's shopping had been unable to get in again, as she had forgotten the tune of the front door.

A SCIENTIFIC BURGLAR.—William Sykes, twenty-seven, of no occu-

pation, charged with loitering with intent. On him was found a complete and exquisite outfit of burglar's tools, comprising two silver-plated pitch pipes, a full range of tuning forks, a mouth organ, and a notebook containing the sol-fa-notation of some 150 well-known airs. Three months.

A PUBLIC NUISANCE.—It is becoming increasingly the habit for young bloods to "celebrate" by parading quiet streets and singing choruses. A group of medical students perpetrated this outrage in Gower street the other night and succeeded in starting open every front door in the thoroughfare. Fined 10s. each and costs for singing in a public place, contrary to the Act.

☞The dew that is annually deposited on the surface of the earth in England is equal to about 5 in. of rain, according to the English Mechanic and World of Science.



To protect its property during a strike a railroad company in the South not only erected strong barriers in the shape of high fences and a picket of armed guards, but on the roof of its freight depot set up two automatic guns which commanded the yards and their approaches. The guns are covered with two army tents.



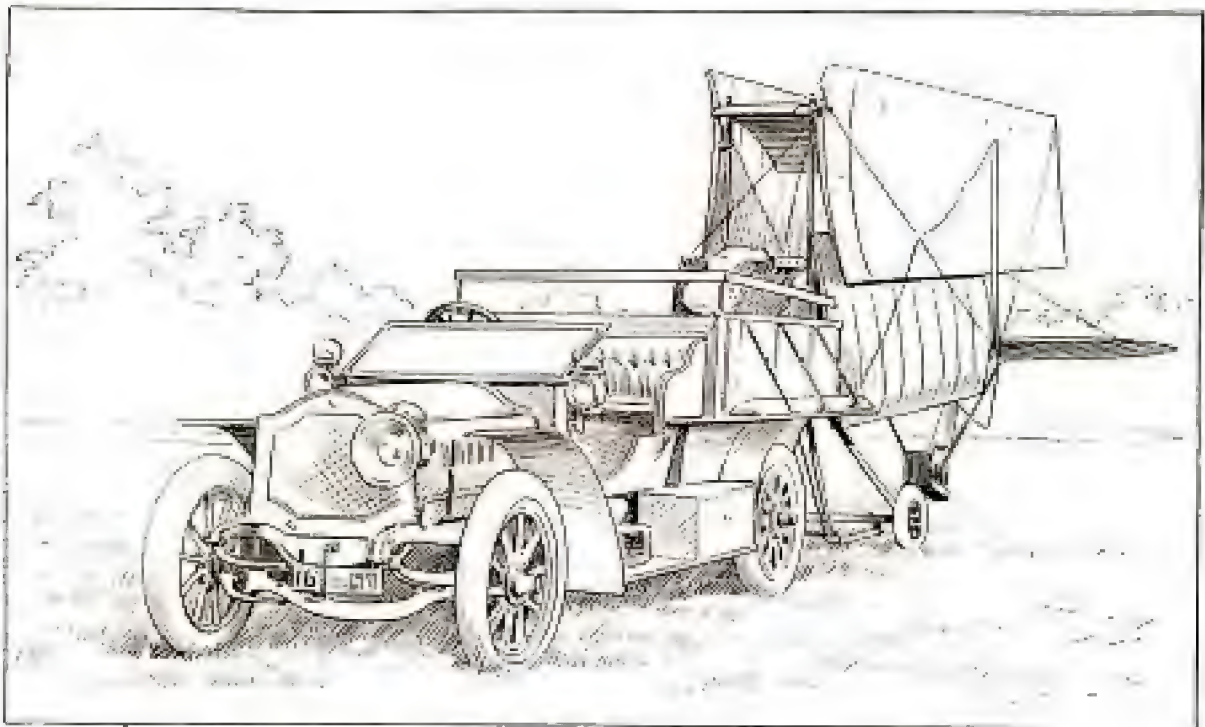
The Island Acquired by Glenn Curtiss as a Winter Experiment Field

CURTISS USES ISLAND AS EXPERIMENT FIELD

North Island, in San Diego harbor, consisting of 1,000 acres of level sand without a tree or building to interfere with flying, has been selected by Glenn Curtiss as his permanent winter experiment grounds. He has an exclusive lease of the island, and expects to accomplish much there this winter, as the climatic conditions are almost perfect.

FRENCH TOW ARMY AEROS BEHIND MOTOR CAR

The experts of the French army have perfected a system of transporting Breguet aeroplanes that made these machines particularly useful during the recent maneuvers. This aeroplane is built in such a manner that its wings can be folded and in this position the machine is towed behind a motor car. The aeroplane rested on its own wheels, as it would just before a flight,



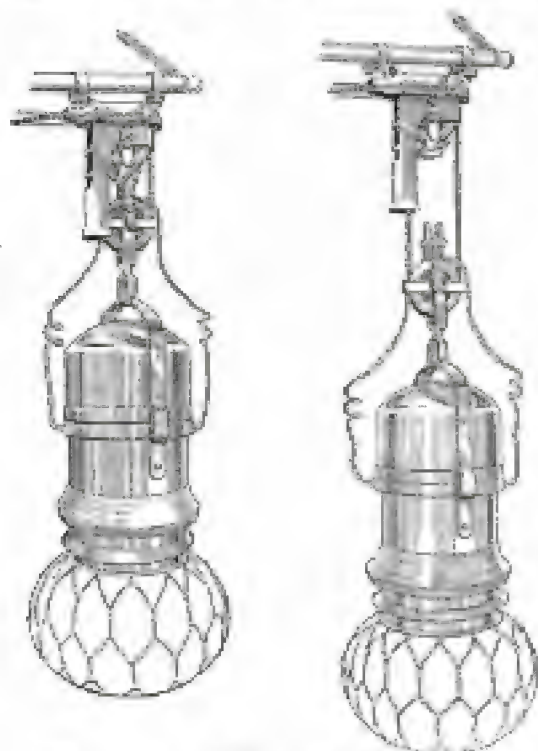
Method Used in French Army for Transporting Aeroplanes

and all that was necessary to make it ready for a trip through the air was the adjusting of the wings. With the wings folded, the width of the machine was only slightly in excess of the width of the car behind which it was

towed. The horizontal rudder gave it the extreme width, and if some means of folding this also could be devised without decreasing its usefulness, it would be possible to make the machine narrower than its automobile tender.

ARC-LAMP HANGER WITH AUTOMATIC CUT-OUT

An automatic cut-out for arc lights has recently been invented for the purpose of reducing the cost of operation



Two Views of the Automatic Cut-Out
Arc-Lamp Hanger

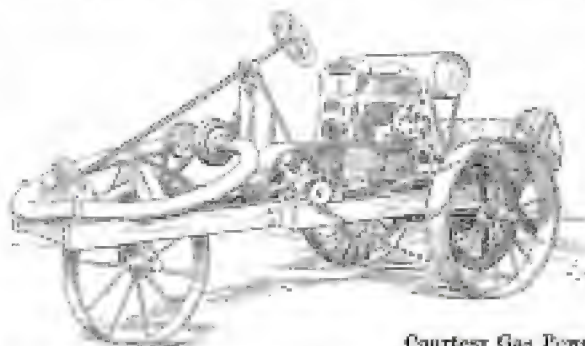
and also to obviate danger in handling the lights. In addition to this, access to the lamp is made possible without the aid of a ladder, the operations of raising and lowering the lamp being all that is necessary to cut off or turn on the current. The new feature is contained partly in the lamp hanger and partly in the lamp itself. A sheave wheel of cast iron is mounted on each part, the two parts being connected with brass latches, the latch on the lower part fitting into that on the upper. These latches form the electrical connection. A quick pull on the rope that goes over the two wheels separates the latches and lowers the

lamp. Another pull in the opposite direction raises the lamp and forms the connection. The rope can be arranged any length. The minute the latches part, the electric connection is broken and the lamp can be handled with perfect safety. The hanger can be used outside as well as indoors.

HOMEMADE FIRE ENGINES FOR FARM

A mechanic in the employ of a California land organization, having 22,000 acres of land, on which are 85 sets of farm buildings, all of which are located either on the river or the irrigation canal, has built three self-propelled fire engines for their protection. All their outfits are of the same design, but the first built has an engine of only 2-hp. capacity, a 1½-in. centrifugal pump, and can make but three miles an hour.

The second and third machines built have engines capable of more power, 2-in. centrifugal pumps, and will make a speed of eight miles an hour. These machines carry 15 ft. of 2½-in. suction hose and 500 ft. of 2-in. pressure hose, and will throw water 75 ft. The pump



Courtesy Gas Power
Homemade Motor-Propelled Fire Engine Used on
California Farm Colony

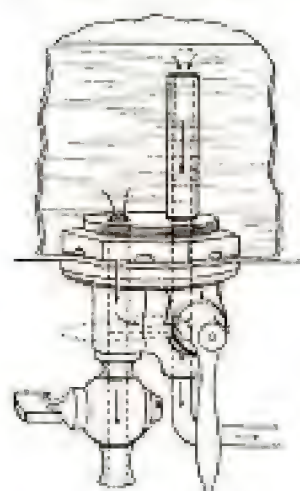
is belted from the flywheel to the engine. The drive transmission is by belts to a countershaft and from the

countershaft to each of the rear wheels. There is no reverse gear, as the machine is sufficiently light to be backed up by hand if necessary. The frame is made of 4 by 6-in. timber, mounted on three wheels, the steering being done by the single forward wheel.

The apparatus has apparently been satisfactory, as the builder and designer means to build two more of them this winter.

GASOLINE-TANK ALARM

A new device to give warning to the motorist that his gasoline supply is running dangerously low has been



placed on the market by a Philadelphia automobile accessories concern. It consists of a pipe extending 2 in. up into the tank, through which the gasoline flows until the supply falls below the level of its top, when the engine stops.

When this occurs, the valve is given a quarter turn, and the remaining gasoline in the tank flows through the lower outlet, giving sufficient fuel supply to carry the car an additional 10 miles.

The complete device weighs less than a pound, and can be easily attached to any tank.

FIRST BRONZE STATUE OF AVIATION MARTYR

The first monument to be erected in memory of an airman who lost his life as the result of his experiments with the aeroplane is about to be erected in England in honor of the late Charles Rolls. The monument will take the form of a bronze statue of the dead man and will be erected at Dover. The modeling is the work of Mrs. K.



Courtesy The Sphere

Casting a Part of the Bronze Statue of Charles Rolls, the Airman. A Model of the Statue is Seen in the Background and the Finished Head is on a Table in the Foreground

Scott, wife of Captain Scott, the Antarctic explorer, and the work of casting the statue was recently commenced at Battersea, England. The airman will be represented as standing erect and will be garbed in the costume he habitually wore while making flights. The statue is being cast in three parts. The head is made first and this is followed by the other two sections consisting of the trunk and the legs. The head has already been finished.

A German engineer has worked out the following mathematical demonstration of the economy of water-borne traffic:

- 1—A horse traveling 3 miles an hour on a level road can haul 2 tons.
- 2—The same horse on a horizontal railroad can pull 15 tons.
- 3—With the same effort on a waterway, the horse can haul 60 to 100 tons.



French Sailing Vessel Wrecked against the Breakwater of an English Fort

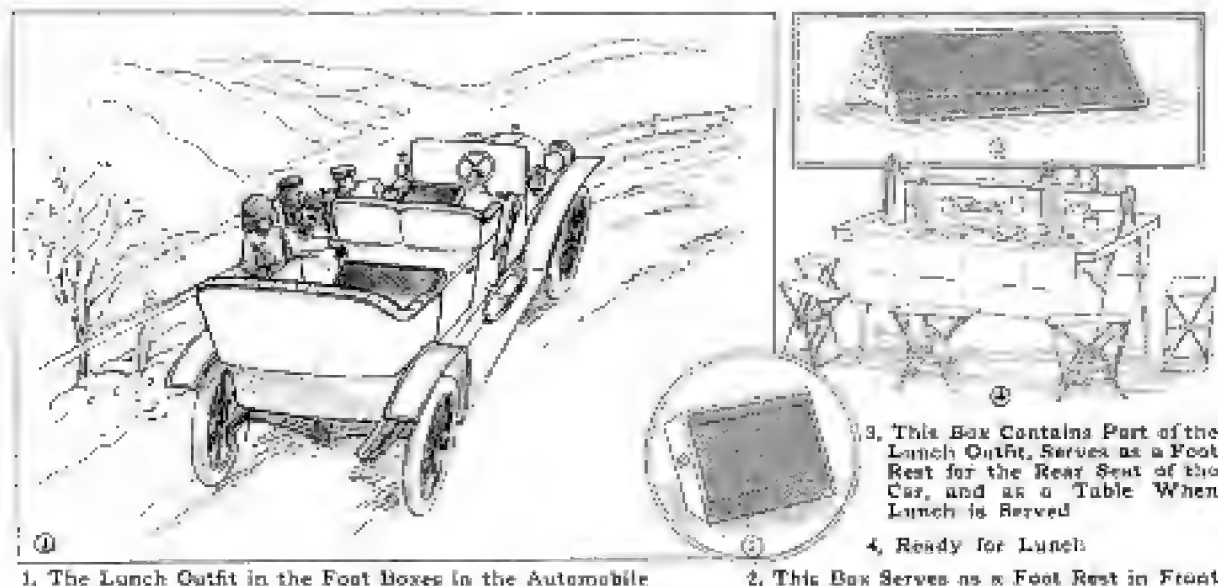
FRENCH VESSEL WRECKED AT PORTSMOUTH, ENGLAND

The defenses of Portsmouth harbor, England, were recently instrumental in wrecking a French sailing vessel. During one storm the vessel was tossed on the concrete boom blocks, where she remained fast while being repaired. Then on the very day she was due to leave, another severe storm arose and threw her against the breakwater guarding Southsea Castle. The view shows her lying against the piles with the seas breaking over her.

PHOTO-ELECTRIC PROPERTY OF METALS

The well-known fact that the non-metallic substance selenium, when exposed to light, becomes a good conductor of electricity, while its resistance against the flow of the electric current under other conditions is very great, has, so far, not received a satisfactory scientific explanation.

Recently, however, a French scientist has propounded a theory, which is interesting and seemingly plausible, because it takes the phenomenon out



COMPACT LUNCH OUTFIT FOR AUTOMOBILES

A remarkably compact lunch outfit has been devised by a British automobile concern for its touring cars. It consists of a table, five stools, and the required tableware, all of which is stowed away in a pair of foot boxes. One side of each box is made to fit the contour of the car, and the upper sides are slanted so as to provide the most comfortable angle for the feet. The longer or rear box, fitted with folding legs, becomes the table when the outfit is set up for lunch, and within it are stored the plates, cups, saucers, knives, forks, spoons, glasses, etc. The other box contains the folding stools and the other utensils required.

of its isolation and ranges it as of the same nature as the so-called photo-electric property of metals, which they all have in common in a higher or lesser degree. This property, most pronounced in aluminum and zinc, is that, under the influence of ultraviolet rays of light and of visible light, excepting red, to a less extent, the metal becomes charged electrostatically and its resistance to the flow of the electric current is slightly reduced.

According to modern ideas, the conductivity of metals or other substances is due to electrons circulating freely and in great numbers within the substance around its atoms and in all directions. When influenced by a difference in potential, the electrons, while still retaining their free and individual movements in all di-

rections, are given also a slow collective motion in the direction governed by the difference in potential, or, in other words, in the direction of the electric current, and it flows through the conductor easily.

The number of electrons in metals is usually very large, and the effect of light cannot sensibly increase it, or, which is the same, lessen the electrical resistance of the metal.

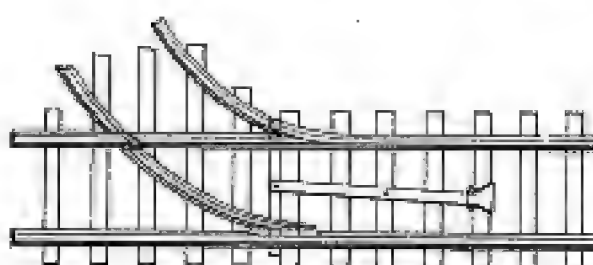
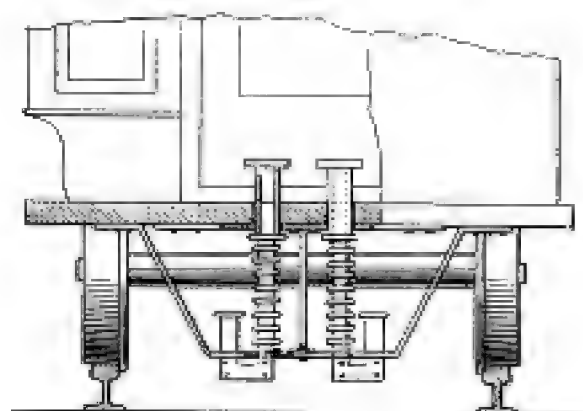
Selenium, on the other hand, being a metalloid, or nonmetallic substance,

and normally of very low conductivity, contains comparatively few electrons, and the scientist contends that it is plausible to assume that the action of light consists in materially increasing their number and thus reducing the resistance of this substance.

It must be admitted, however, that one point weakens the argument somewhat; that, as regards metals, the ultraviolet rays are most active, while in the case of selenium, the visible light rays produce the greatest effect.

SWITCH OPERATOR FOR ELECTRIC CARS

A rather unique switching apparatus, by means of which the motorman of an electric car can throw a switch without leaving his position or



Top View Shows the Foot-Operated Rods by Means of Which the Motorman Swings the Sway Bar of the Switch—Lower View, the Sway-Bar Arrangement in the Track

completely stopping the car, has been designed by a Texas inventor. The mechanism on the car consists of two J-shaped throw rods, at the ends of which are striker heads. The rods are pushed down into position by the foot of the motorman, and are returned

to their original position by a coiled spring when the foot pressure is withdrawn.

The track device consists of a sway bar pivoted to a tie by means of a pin through the center of the bar, a bridle bar connected to the two switch points and itself attached to one end of the sway bar, and a cam head, having a V-shaped groove formed within its upper surface, attached to the other end of the sway bar. When the motorman wishes to throw the switch, he presses down one or the other of the throw rods, depending upon what position the switch is in. This brings the striker head of the throw rod in direct alinement with the V-shaped groove, and the sway bar is actuated to throw the switch.

SCIENTIST MAKES SUGAR FROM NIPA PALM

The sugar industry in the Far East will be revolutionized, if the discoveries recently made by Prof. H. D. Gibbs of the Philippine Bureau of Science can be commercially utilized in extracting sugar from the nipa palm. Prof. Gibbs has made sugar from the sap of this species of palm, which has a polarization of 96.8 per cent, 8 per cent higher than the highest polarization of sugar made from cane. Nipa grows abundantly throughout the Orient, and from it is produced an alcoholic drink called "bino."



French Transporter Bridge Drawn Back and Forth on a Railway 22 Ft. under Water, the Drawing Power Being an Electric Motor

"BRIDGE" WHICH RUNS ON WHEELS

A unique "bridge" at St. Malo, France, carries passengers on a platform mounted on high supports which run on rails 22 ft. under the surface of the water. It carries passengers

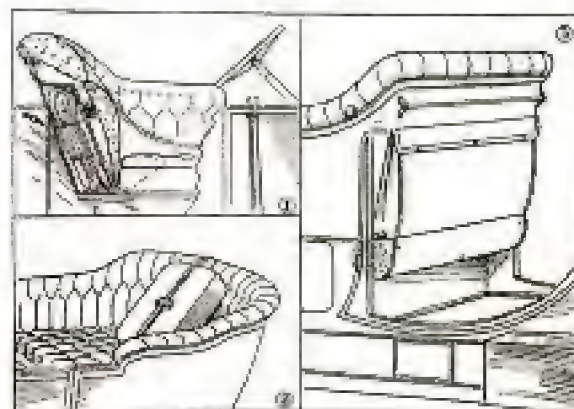
only and is drawn from side to side by an electric motor. This novel form of bridge obviates many difficulties incident to the ordinary design of bridge.

FINDING STORAGE SPACE IN AUTOMOBILE

Two ways of utilizing waste space to the best advantage, and an interesting cushion idea, are shown in these drawings. Spare inner tubes should be protected from contact with other articles, as they are very easily injured, therefore a pocket in the back of the driver's seat is suggested. To reach the tubes, it is only necessary to take out the cushion and raise the door. This door is made the width of the folds in the trimming, and the hinges, being at the place where the points meet and the buttons are placed, do not show. The back of the driver's seat is covered with as thick upholstery as the other front seat, but as it has less depth, the space behind it is available for the storage of the two inner tubes, which are suspended from a removable bar.

The cushion idea shown is one

which has found much favor among British motorists. Strapped to the back of the rear seat in the center, it serves as an arm rest when there are but two persons on the seat, and, when there are three, it allows the additional passenger to sit well forward, thus avoiding crowding, and by leaning



Courtesy The Automobile

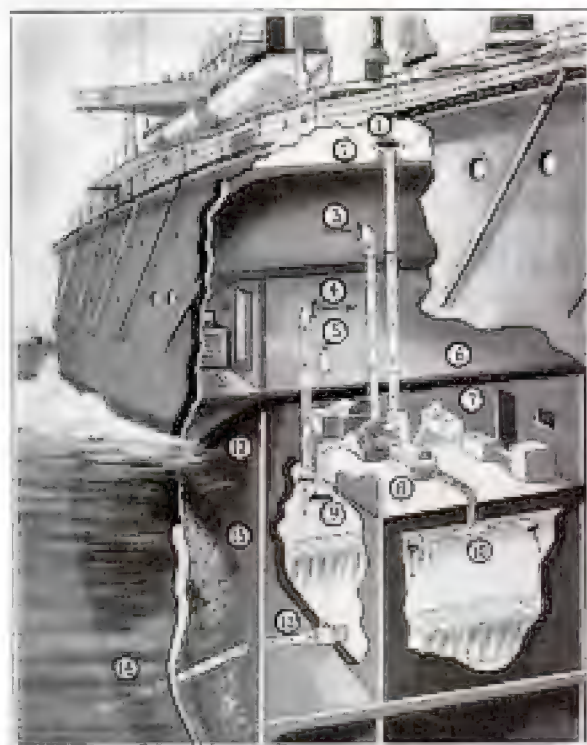
1, Space Back of Driver's Seat for Spare Inner Tubes; 2, An Ingenious Cushion Arrangement; 3, Pocket and Cylindrical Box for Storage of Storm Curtains

back against the cushion still to have a comfortable seat.

The other illustration shows a method of carrying storm curtains, and consists of a leather pocket, projecting not more than 5 in. from the back of the seat, and a cylindrical metal box fastened underneath. The leather flap covering the opening of the cylindrical box is a continuation of the leather pocket. The box and the pocket provide room sufficient for all the curtains of the car. The arrangement does not interfere with the usual robe rail.

MAGAZINE PROTECTION OF BRITISH WARSHIPS

The fact that not one British warship has been destroyed by the explosion of a magazine, or from any other internal cause, since 1881, when the six-gun sloop "Doterel" blew up in the Straits of Magellan, is due to



The Elaborate System of Safeguarding the Magazine of British Warships—1, Fresh-Air Inlet; 2, Weather Deck; 3, Foul-Air Outlet; 4, Escape When Flooding; 5, Sea-Inlet Control; 6, Armor-Protected Deck; 7, Cooling-Chamber; 8, Cool Air Delivered to Magazine; 9, Foul-Air Escape; 10, Magazine; 11, Sea Inlet to Flood Magazine; 12, Water Line; 13, Coal Bunker; 14, Sea Inlet

the elaborate system of safeguarding the magazines.

The magazines of British warships are low down in the hulls, out of the way of hostile projectiles, and as far as possible from furnaces, boilers and other heating agents. Each magazine has two steel walls, 6 in. apart, the space between them being filled with cork to deaden the force of an explosion, should one occur. The explosives are also isolated in many small boxes, and an elaborate system of air-cooling is provided to keep the temperature at a constant and fairly low level. Any magazine can be flooded instantly by means of its sea valve, the operating mechanism of which is located where it can be reached under any circumstance making flooding necessary.

Another important safeguard consistently maintained by the Admiralty is the keeping of only a small reserve of explosives and explosive shells, thus doing away with the danger arising from deterioration by age. It is claimed that French warships carry ammunition that has been in store for nine years or more, while the British warships carry nothing that has left the factories more than three or four years.

A LONG-DISTANCE PIANO PLAYER

The latest variation of this popular device is one by which a piano may be operated at any desired distance. It is intended for use with pianos located in public rooms, restaurants, etc., where it would be desirable to keep the operator, the music rolls, and other apparatus out of sight.

The piano is fitted with a set of electromagnets, one magnet for each key and pedal. Each of these magnets is connected to the operating device by its own wire, the different wires being bundled together like a telephone cable.

The operating mechanism is actuated by an ordinary electric motor working on any commercial type of electric

current. The customary perforated-paper music roll is employed.

The motor drives the rolls that carry the perforated paper and also a rotary vacuum pump. A closed cylinder with a row of small openings on its upper side is so arranged that the air can be exhausted from it by the air pump. These openings are closed by the unperforated portion of the roll.

When a perforation in the paper exposes one of the holes into the vacuum chamber, air rushes in and depresses a spring-supported pin so that an electrical contact is made. Each opening and pin is connected electrically with the previously-mentioned electromagnet of the corresponding key, and the closing of the current causes this key to be struck. The force with which the notes are struck depends upon the amount of current transmitted to the magnet, and this is regulated by other holes and contact pins in the vacuum chamber.

The time of the music is regulated by changing the resistance in the circuit connected to the motor. These resistance coils, both for controlling the time and the strength of tone, are arranged as a sort of rheostat that is normally stationed at the half-way point. This allows automatic regulation either way by increasing or decreasing the flow of current. The pedals are controlled similarly. The device may be clearly understood if one remembers that each operation, whether striking a key, depressing a pedal, changing the time or changing the force with which the key is struck, is controlled by its own air hole and contact pin in the vacuum box.

When the selection is finished a single hole in the sheet makes a contact that reverses the winding mechanism, rewinds the music and sets everything ready for the execution of the next piece.

THE SAND COLONISTS OF CONEY ISLAND

Defying the demands of the government, a colony of squatters who have their habitations on the sands of Coney Island, New York, are waging a losing fight against the sands, into which the aforesaid habitations are slowly but surely sinking. Only constant work with the spade saves them from premature burial.

The history of this colony of rent and tax evaders makes a unique chapter in the annals of homesteading.

The story begins a few years ago when the pioneers of the present sand colonists appeared in the shape of a houseboat party. The spot was then a pretty bay, fishing was good, bathing ideal, and the house party spent a very cheerful two weeks at the beginning of the summer, quite satisfied with the seclusion of the place and hoping that the quiet little nook would not be intruded upon by other vacationists. But this was not to be. One houseboat usually attracts another, and soon other

summer holiday makers came to share the fishing and the bathing at this sea-side spot.

At the end of the summer some of the houseboat owners decided to remain and try winter houseboating. The spot was convenient to the city, the cars being not far away, and the idea seemed a good one. Anyhow, several houseboats remained and with them two or three of the smaller boats. So, partly on the water and partly ashore, the members of the little colony managed to live very comfortably and economically, for the spot was a barren waste and no one thought of questioning the right to erect shacks on the sandy stretch to supplement the floating habitations.

But one day trouble appeared in the shape of a party of government engineers who, in answer to inquiries from the colonists, gave the information that the little bay was to be eliminated from the map for strategic reasons.



The Living Porch of the House Built above the Submerged Scow. The Open Space of the Second Floor might be Considered as a Sleeping Porch

The squatters were told that they must remove from the spot. As squatters usually do, they defied this edict and remained. The engineers said nothing and went on with their work. Soon the filling in of the little bay reduced the water on which the houseboats and their attendant craft floated to the proportions of a lake and then to a pond, and it became evident that there would be no more sailing for the little flotilla.

The fleet was hopelessly landlocked. As the work went on the pond completely disappeared and the houseboats and other boats were high and dry on the sand waste, no longer boats, but merely habitations. The colonists did not care much. They intended to stay no matter if the government had decreed that they should no longer float on the water, but rest in the sand.

Then the treacherous sand began to



This is the Largest Habitation in the Sand Colony and is Built above a Scow that is Sunk in the Sand



A Certain Amount of Shoveling is Required Each Day, to Prevent the Sand from Completely Covering the Habitation

attack the stranded homes. The colonists, alarmed at the way their boats were sinking in the sand, set about building more solid habitations, and then something else happened. It was found that the sand waste had an owner. The sandy stretch had been in litigation for years, but it was not the "no-man's land" that the squatters thought it to be and therefore no building could be erected there without a

permit. No permit could be obtained, of course, and therefore it remained for the squatters to save their habitations from the sand as best they might. One, more ingenious than the others, erected a big tent from the remains of the sails of a wreck in the vicinity. The erection of the tent did not conflict with the building laws. Under cover of this tent the squatters erected a substantial habitation. Then they



Only the Top of the Deckhouse Uncovered. During Wind Storms This, Too, Disappears

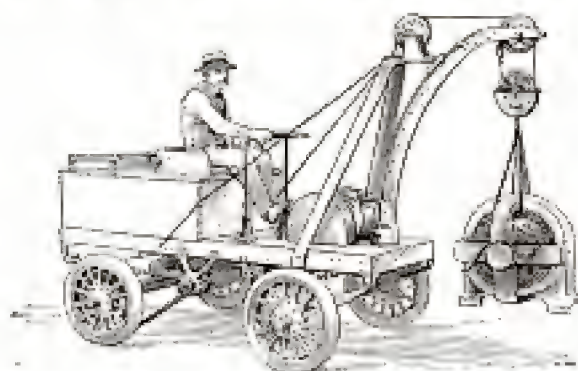
tore the canvas cover off and no one has interfered with them since. The structure thus erected is the big barrack-like building seen in one of the illustrations. It was built entirely of driftwood collected in the neighborhood, with one of the sunken boats as a foundation.

Not so the others. They are sinking out of sight and are a constant

source of anxiety to the colonists. Only by perpetual vigilance and hard work are the squatters saved from a sandy grave. In the winter when the weather is stormy and the sand blows around like the billows of the ocean, the boats are often sanded under completely and the squatters have to organize digging parties to unearth the buried members of the colony.

ELECTRIC TRUCK-CRANE

An electric motor-truck crane, designed for unloading, loading, and transporting the loads for short distances in yards and shop buildings is shown in this illustration while trans-



Electric Truck-Crane Unloads, Loads, and Conveys Loads

porting a one-ton load. The hook of the swinging crane, which is mounted on the front end of the truck, is raised and lowered by a hoist of one-ton capacity mounted just back of the crane, the motors driving the hoist and the vehicle being operated from a battery on the rear end of the truck.

When material is to be unloaded and deposited within a 6 to 8-ft. radius, and this action does not require the material to be moved vertically more than 10 ft., the truck is run into position, the brakes are set, and the truck remains stationary, the boom of the crane moving back and forth between the picking-up and deposition place. When material has to be transported to a distance in the warehouse or yard, the truck picks up the load from the railroad car or wagon, conveys it

to its destination, and sets or piles it where desired. The short wheelbase permits the driving of the machine about warehouse and shop aisles.

STEEL FURNITURE FOR SHIPS

A European company is making a specialty of steel furniture for ships, maintaining that such furniture is a necessary feature in eliminating the danger of fire. All the fixed and movable furniture required for the public rooms as well as for the staterooms of a great liner are being made entirely of steel, and of a weight not greater than that of wooden furniture. Where a decorative effect is desired, the finish is grained in imitation of mahogany, walnut, or any other kind of wood, by a process which produces a result difficult to distinguish from the real.

WORLD'S TIN SUPPLY LIMITED

Early in the present year tin was quoted at \$981 per ton, or close to 50 cents per pound, and, although a decline began at this point, the prices have been abnormally high all the year. Fifty cents per pound means that tin was valued in the world's markets at nearly four times the value of copper. According to the Artisan and Hardware Record, the world's supply is limited to about 100,000 tons a year, and of this amount the tin-plating industry alone is credited with using 25,000 tons.



Dog's Mouth Held Open by Straps during an Operation



Removing a Growth from a Parrot's Mouth

GERMAN ANIMAL HOSPITAL

One of the finest animal hospitals in the world is located in Berlin, and is maintained by contributions. Founded many years ago by a society organized to prevent cruelty to animals, it has steadily grown and now has a very modern equipment. Although fees are charged when the owners of animals are able to pay, the

greater number are free patients. Every animal brought to the hospital for inspection or treatment must undergo a bath.

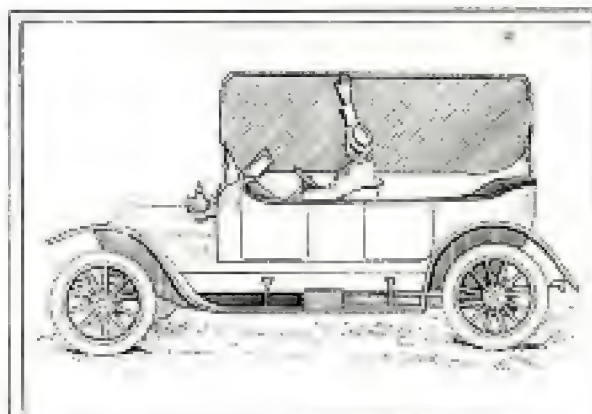
Many of the animals are brought to the institution by a Mrs. Hinze, the inspector of the anti-cruelty society. She makes her rounds on a bicycle, carries a valise containing cotton,



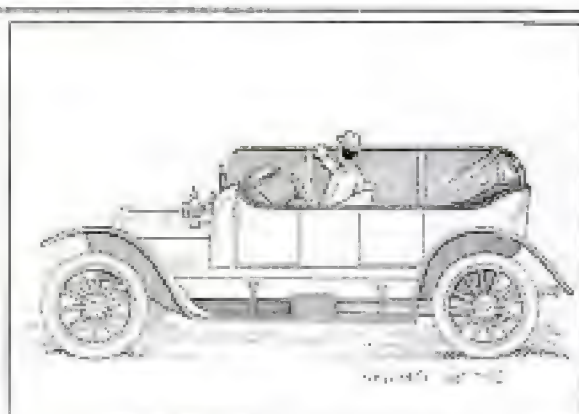
Testing the Lungs and Heart Action of an Italian Organ-Grinder's Monkey



Giving a Dog a Bath at the Animal Hospital in Berlin after Admission for Treatment



Pushing New Type of Canopy into Collapsed Position



Pushed Nearly into Inoperative Position

acids, and first-aid-to-the-injured implements, and often treats the animals on the street. In extreme cases she sends for the hospital ambulance.

COLLAPSIBLE CANOPY FOR AUTOMOBILES

A rather novel type of canopy or hood for automobiles was exhibited at the recent show in London. It is entirely different from ordinary types,

being raised from and lowered to the side of the car, instead of the rear. The whole structure rises bodily into position, assisted in so doing by a spring-and-lever arrangement which is hidden from sight. Two steel tubes, one at the forward and the other at the rear end of the body of the car, support the top, there being no side supports to impede access to the car. Either fixed or detachable side curtains are provided.

SPECTACULAR TESTS OF SUBMARINE MINES

Experiments recently held in New York harbor demonstrated that the submarine mines adopted for the coast defense of the United States have

tremendous power. Officers of the army conducting the tests exploded several mines, in the bay off Fort Wadsworth, under targets towed behind tugs. The explosions threw up columns of water ranging from 200 to 300 ft. in height.



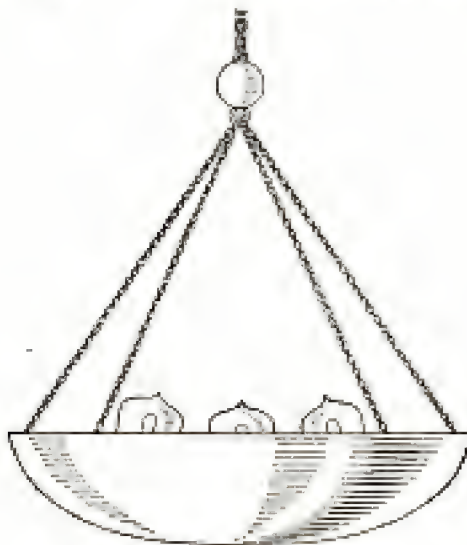
Columns of Water Thrown Up by Exploding Submarine Mines



Lighting Moving-Picture Theaters

To meet the requirements of the new law in a certain city, various nickelodeon managers have tried different methods of lighting their theaters while the moving pictures are being shown. The majority have installed green lights on the side walls, with which, although a dim light is furnished, it is hard to distinguish one person from another.

A unique lighting method, which makes the theater as light as day, has been employed by the manager of one theater. The ceiling of the theater was painted white and six electric lights were placed inside of wooden chopping bowls, 2 ft. in diameter and suspended from the ceiling. Although no lights are visible to the audience, the light reflected from the ceiling

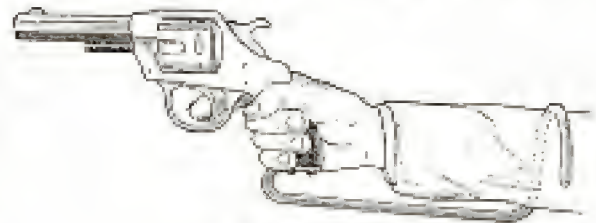


Lights in a Chopping Bowl

illuminates the entire theater, and one can even read a newspaper while the pictures are being shown.—Contributed by Geo. A. Obenauer, Buffalo, N. Y.

Extension Stock for a Revolver

When firing a large revolver, it is hard to hold it from kicking out of range and missing the mark. With the



Stock Made of Rod Iron

use of the little device shown in the sketch, the weapon can be held steadily, and accurate shooting will be an easy matter. The device is made of an iron rod, about $\frac{3}{16}$ in. in diameter by $15\frac{1}{2}$ in. long, bent as shown in the sketch and attached to the revolver with two screws. The hook end of the rod is placed over the forearm when firing the revolver.—Contributed by Gilbert H. Holter, Jasper, Minn.

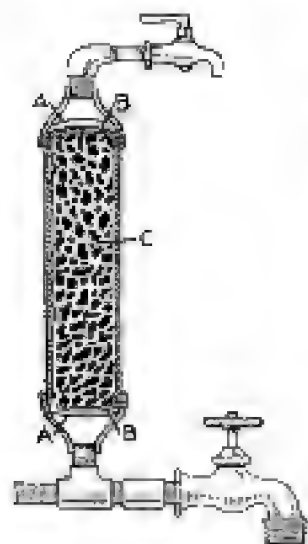
Adjusting a Battened Door

A cottage door made of boards and battened can be adjusted in the following manner: Take the door off its hinges and stand it in a vertical position, grasp the sides and jolt it forcibly down on a heavy block or stone on the corner that is low. The weight of the door added to the force of swinging it down on the block will quickly put it in proper shape.—Contributed by John V. Loeffler, Evansville, Ind.

CA garage should be built to exclude all dampness, as moisture will cause much labor to keep the brasswork clean, and will also corrode part of the machinery.

A Water Filter

A cheap, simple and efficient water filter may be made of ordinary pipe and fittings. Owing to the bad condition of the water supply in our city, I constructed such a filter, and it gave good results. The filter is attached to the water main just back of the faucet. The large pipe or body of the filter is filled with charcoal, C, which is held in place with wool felt or filter paper, B B, and backed with wire gauze, A A. The main body of the filter is made of 1½-in. pipe with 1½ by ¾-in. reducers on the ends.—Contributed by Whitney W. Jones, Baltimore, Md.



The arrangement can be better understood from the sketch. A very good effect can be obtained without the use of the mirrors by placing the basement display back far enough to be viewed direct. In the sketch, A represents the eyes of a person viewing the basement display C through the mirror B. The display D can be seen direct.—Contributed by Merle Robinson, Pittsburg, Pa.

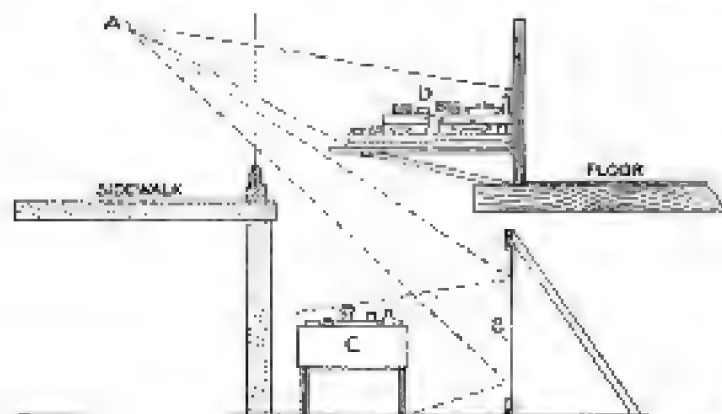
Care of Oil-Soaked Waste and Rags

The danger of spontaneous combustion from rags or waste saturated with oil in shops, garages and residences is not sufficiently understood. This is, no doubt, because most people do not know that linseed oil will oxidize rapidly, and if cotton is soaked with oil, enough heat will be generated in a short time to char the cotton. The addition of red lead seems to make the heating more rapid, as pipe fitters have frequently observed.

It is a common thing for pipe fitters to clean the red lead and oil from a new joint by wiping it with a handful of waste. It is also common for the workman to carry the waste in his pocket. A pipe fitter once felt a hot spot against his body, which caused him to investigate his pocket with the result that he found a pocket lining burned out and a mass of charred

Enlarging Window-Display Space

The proprietors of a store doubled their show-window space by the method shown in the sketch. The floor and joists under the window-display space were cut out and a display placed on the basement floor near the front wall, or partially under the sidewalk,



Two Displays in One Window

and four large plate-glass mirrors were so arranged that those entering or leaving the store could view the display.

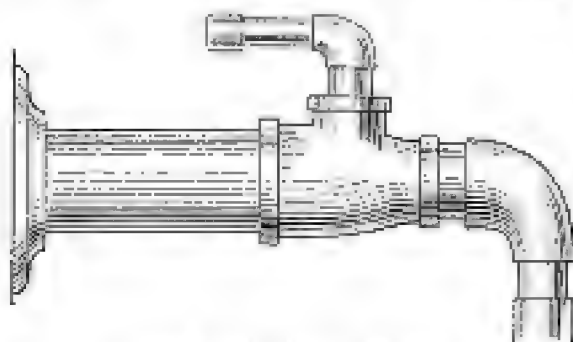


waste. If this jacket had been hung in the clothes closet at home, a burned dwelling might have resulted, with the origin of the fire a mystery.

The safe thing to do is never to put oil-soaked rags away for safe keeping. Either burn or wash them at once. In mills, power stations, shops, garages, etc., where there is a quantity of oil-soaked waste, cans should be provided to receive the discarded waste. The cans should be made of heavy sheet metal with riveted seams, and with iron legs to hold them several inches from the floor. Use a tight-fitting metal cover.—Contributed by F. W. Brady, Scranton, Pa.

A Plumber's Sign

An enterprising plumber constructed a very attractive sign that at once suggests the kind of business carried on within. The sign is in the shape of an ordinary faucet constructed of large



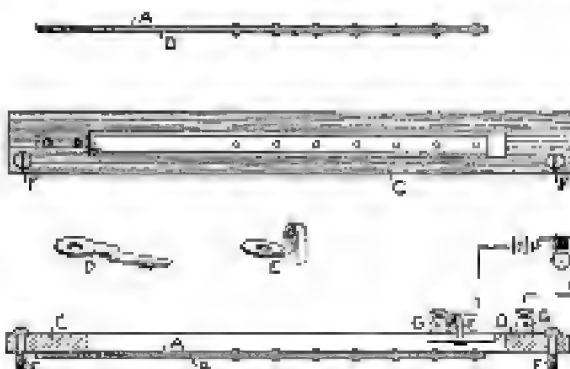
Sign Made of Pipe Fittings

pipe and fittings. It is about 2 ft. long and painted yellow to look like brass.—Contributed by John J. Keenon, Chicago.

Alarm for a Hot Bearing

The alarm consists of a device very similar to a thermostat. A tongue is made of a strip of copper, A, and a strip of zinc, B, both the same size and gauge, riveted together with small rivets. The tongue is fastened to the base C, made of $\frac{1}{4}$ -in. fiber similar to an organ reed. The slot in the fiber should be about $\frac{1}{8}$ in. wider and $\frac{1}{2}$ in. shorter than the tongue. Two screw holes, F F, are drilled in the fiber, as shown. The tongue is fastened to the base with the copper side in contact with the fiber. The electrical con-

tacts are made as shown at D and E. These contacts are attached to the fiber



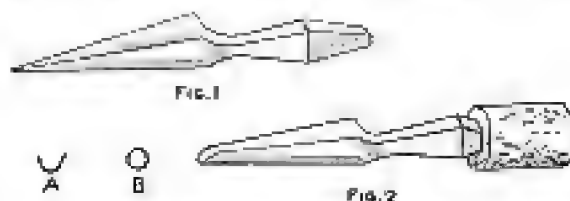
Thermostat and Connections

base with binding-posts, G G. The circuit is wired as shown.

The action is as follows: The instrument is fastened flat on the bearing cap with the metal tongue in contact with its surface. If the bearing gets warm, the zinc will expand much more than the copper strip, which causes the tongue to curl at the free end. In doing so it lifts the lever contact D into contact with E, thus closing the circuit and ringing a bell or lighting an electric light, as the case may be.—Contributed by W. W. Savage, Buffalo, N. Y.

Bit Used as a Belt Punch

An old-style gouge-shaped bit, as shown in Fig. 1, rounded at the point, as in Fig. 2, makes a good emergency belt punch. A handle may be made of a cork. The shape of the cutting point of the gouge is shown at A. This



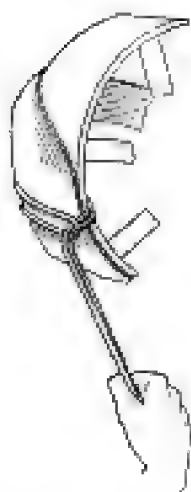
Bit Formed to Cut Round Holes

will make a neat round hole, B, if the tool is turned when cutting the hole.—Contributed by James M. Kane, Doylestown, Pa.

☞ Sew straps to the sides of mattresses and they can be handled more easily.

Replacing Belts on Wheels

The contraction of a belt not used for some time will make it hard to replace it on the pulleys. The same trouble may be experienced after cutting out a little too much material



when taking up a belt. In either case, the belt cannot be readily put on the pulleys by hand or with a stick. A safe way is to proceed as follows:

Procure a piece of rope, 6 or 8 ft. long and not over $\frac{1}{2}$ in. in diameter,—preferably a piece of window-sash cord. Place the belt around the driven pulley after the power is stopped. Double the rope and pass the loop end through the driving pulley just ahead of one spoke. Put the belt on this pulley and around it as far as possible by hand, then pull the loop around the belt and pass the two ends of the rope through the loop and draw it up tightly, holding the ends in one hand. Start the power slowly and the belt will easily run on the pulley, and as it does so, let go of the rope ends. The belt will cause the loop to open and the rope will ride to the next pulley and fall to the floor.—Contributed by H. E. Parker, Bridgeport, Conn.

Gas Purifier for Automobile-Lighting System

The purifier consists of a cylinder made of $1\frac{1}{2}$ -in. brass tubing, with ends of sheet brass soldered in. The cylinder is placed transversely under the



Location of Tank in Pipe Line

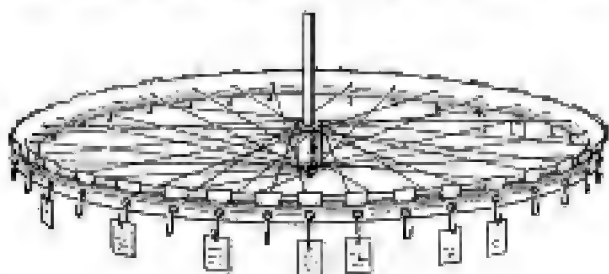
front of the engine, as shown in the sketch. The pipes leading to the headlights enter the ends and nearly reach

the center at the top of the chamber, as also does the pipe from the generator. The reason for this arrangement is to avoid filling the tubes with water when the car tips.

This device serves a twofold purpose. It keeps all water and lime dust from the lead pipes, and also serves as a storage tank for the gas, preventing flickering and other troubles and furnishing a more constant pressure. A stopcock is soldered in the bottom to drain the tank, though the purifier will operate when almost half full of water.—Contributed by Donald H. Johnston, Collins, O.

Sales-Ticket File

A very useful and handy device for the rapid filing of sales tickets is shown in the accompanying sketch. The owners of a department store, employing 30 clerks, were obliged to use as many spindle files as there were clerks. They could not use a card-index system for the rapid filing of the sales



Filing Sales Tickets on Bicycle Rim

tickets, so they suspended an ordinary bicycle wheel, with the tire removed, from the ceiling, and on its rim hung 30 hooks, one for each clerk, and each marked with a small tin plate tacked to the rim bearing the file number. The wheel being placed so that the hooks were within convenient reach of the cashier's right hand, any number could be readily located by turning the wheel.—Contributed by Axel C. Hanson, Lincoln, Neb.

¶The best sidewalk manhole guard is a barrel with both ends removed. Lighting and ventilation are perfect.

The Art of Stencil Making

By HOMER H. KNODLE

Part II—Cutting

After the design is originated, which may be much smaller than the stencil, the next step is to transfer it to the manila paper used to make the stencil. This is done by the use of dividers and drafting tools, and the measurements should be in such proportion that the design will be enlarged to the necessary size. Two boards are needed, one, built as described, to do the cutting on, and a regular drafting board. The reason for having two boards is that if the cutting is done on a drafting board, it will soon be useless for drafting. For drawing out the full-size design, a 31 by 42-in. board will be large enough. The cutting board should be larger, not less than 36 by 55 in. in size, and constructed as follows:

Using good white-pine boards dressed on four sides, not less than $1\frac{1}{2}$ in. thick and 6 in. wide, build a board as shown in Fig. 12. The cross-pieces should be of the same material as the board and fastened to the board with screws, using at least two to each piece making up the board. The support is made from heavier lumber, substantially as shown in the illustration. The board may or may not be inclined, as desired.

The usual size of stencils ranges from 2 by 6 in. to 30 by 50 in. The paper used should be 3-ply manila,

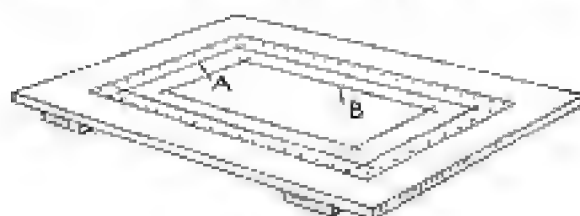


FIG. 13
Drawing Board

which can be obtained cheaply from a printers' supply house. The paper should be cut about 4 in. larger each way than the extreme size of the stencil to be made, to allow an edge for tacking to the board, as shown in Fig.

13. The tacks are placed around the entire edge of the paper, so as to hold it firmly. One-ounce tacks will be found amply large.

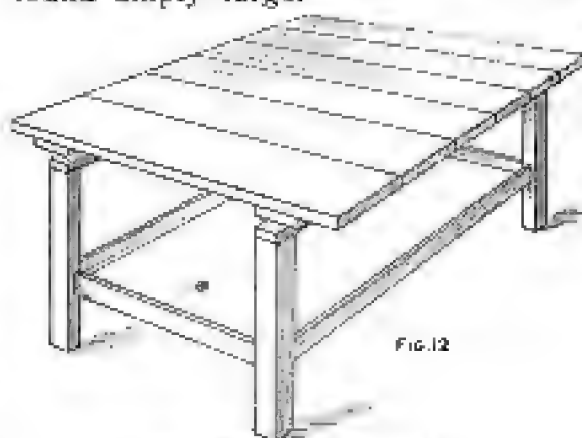


FIG. 12

Cutting Board and Stand

In drawing the large full-size designs, the triangles should be from 12 to 16 in. long. (Triangles made of wood are not expensive.) After the paper is fastened to the board, lay out the extreme border line A and the design border line B, as shown in Fig. 13. Starting at the left-hand part of the border, draw in the design just as it would appear on the wall, as shown in Fig. 14, paying no attention to the binders. The best effects are usually obtained when the design is finished as a whole and not each particular part separately.

The number of binders to hold each part of the design should be considered. An especially large surface should have more than three binders, while for ordinary-size pieces, three binders, if properly placed, will hold the piece in position very well. In handling very small units, two binders will be found sufficient, but never less than two. The location of the binders are marked with a red crayon, as shown by the dotted lines in Fig. 15. Beginning at one corner of the design go over it to see if any have been omitted, as a binder cut out will spoil a stencil. Mark each part to be cut out with blue crayon.

It will be found best to follow, to some extent, the outline of the piece, so that when a binder is reached, the colored crayon will be a signal to look out for the red line. A finished design as it will appear when stenciled on a wall is shown in Fig. 16.

The knives which will be found useful in cutting out stencils are shown in

Fig. 17. These can be obtained at any hardware store. One is a common steel eraser and the other is a Swedish carpenter's knife. No other tools are necessary. The operation of cutting out the stencil is purely mechanical and consists of simply following the lines drawn, being careful to hold the knife so that a perpendicular cut will



Fig. 14

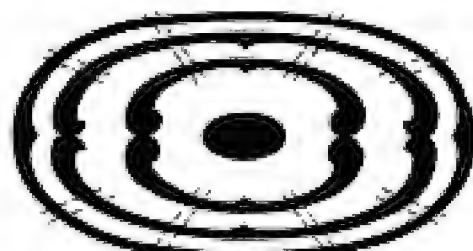


Fig. 15

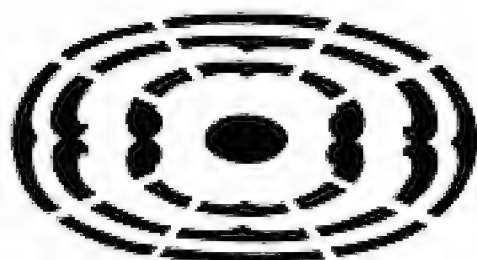


Fig. 16

The Full Size Design



Fig. 17

Marking the Binders
Cutting Knives

Fig. 17. These can be obtained at any hardware store. One is a common steel eraser and the other is a Swedish carpenter's knife. No other tools are necessary. The operation of cutting out the stencil is purely mechanical and consists of simply following the lines drawn, being careful to hold the knife so that a perpendicular cut will

done before the outside border of the stencil is cut away so as to have all the surface well oiled. A name and address, or some other mark, should be stamped in one corner before oiling, so as to designate which side to place against the surface to be stenciled. This will preserve a clean surface on the stencil.

(To be continued.)

Repair on an Automobile-Horn Bulb

The ordinary rubber horn bulb used on an automobile can be repaired with the use of a vulcanizer in the following



Fig. 1



Fig. 2



Fig. 3

The Split and Its Repair

manner, as described by the Automobile Dealer. A very common form of

damage, a split on the top of the bulb, is shown in Fig. 1.

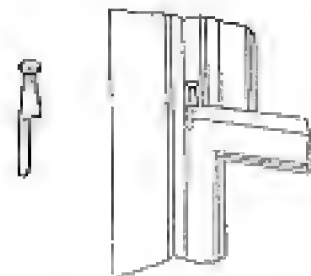
The first process of repair is to thoroughly clean the rubber where it is split, with benzine, outside and, if possible, inside. The inside of the rubber should be roughened with a rasp or wire scratch brush, and the outside edges of the split beveled off with a pair of scissors and roughened with a rasp. The split after this treatment is shown

in section in Fig. 2. If the size of the split is sufficiently large to make this possible, a piece of old inner tube should be inserted to cover the split, the rubber having previously been roughened and covered with vulcanizing solution. The inside of the bulb is also treated with the vulcanizing solution. It will be easier to insert and place the patch before the solution dries.

The split and beveled portion should be coated with the solution and allowed to dry, if possible, for several hours. Some lengths of vulcanizing compound, about $\frac{1}{4}$ in. wide, should be cut and softened by heating on the vulcanizer and then pressed into the V-section split until the whole is level with the outer surface of the bulb. The lower part of the bulb can then be pressed up as shown in Fig. 3. The doubled-in portion, back of the split, should be filled with waste or rags as tightly as possible and the whole covered with a piece of thin linen, sprinkled with soapstone where it comes in contact with the vulcanizing rubber. Care must be taken that no creases in the bulb are allowed to remain in contact with the vulcanizer, as this will make them permanent.

Anti-Rattler for a Window Sash

An ordinary wood clothespin, having one leg broken off as shown in the sketch, makes



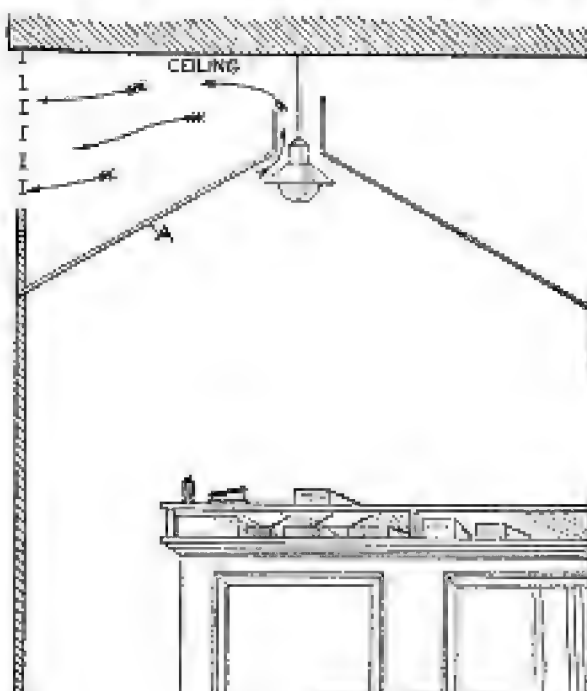
sketch, makes a good anti-rattling device for a window sash. The remaining leg of the pin is pushed between the sash and window casing.

—Contributed by Paul H. Burkhardt, Blue Island, Ill.

¶The tires of an automobile placed in storage should be cleaned with castile soap and tepid water and then stored in a dark place, well ventilated.

Ventilating with a Gas Lamp

A small cigar store located in a large office building had no outside opening and the air was bad and made more so



Lamp Ventilator

by the smoke from the patrons' cigars. To obtain good ventilation for this room, it was fitted with a sub-ceiling, A, tapering up to a peak in the center. A large gas lamp was placed in an opening in this peak, so that the heat from the lamp and its consumption of air created a strong upward draft which causes the smoke and air to flow out of the room and exhausts it into the main corridor through a perforated plate. The lamp must be used continuously regardless of the brightness of the day. — Contributed by Albert Scheible, Chicago.

Wallpaper Protection

The condition of the paper on a wall behind pictures may be kept similar to that on the uncovered surfaces by placing a glass push pin in the wall where each lower corner of the frame rests. This keeps the picture away from the wall and allows the air to circulate freely.

Pole for Hanging Pictures

The accompanying sketch shows a holder for picture-frame hooks for use in hanging pictures. The holder can

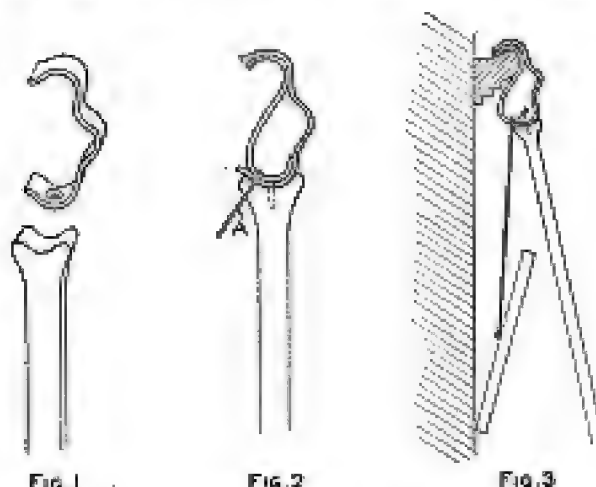


FIG. 1

FIG. 2

FIG. 3

Clip on the End of Pole

be made of brass or steel, $\frac{1}{2}$ in. wide, or slightly under the width of the picture hook. When forming the holder, as shown in Fig. 1, use a hook as a pattern or form. Make half of the lower bend first, then drill a hole for fastening it to the rod or pole, as shown. Cut out the end of the pole to fit the holder and attach it as shown in Fig. 2. The hook is placed in the holder and the picture-frame wire A in the hook. The manner of hanging the picture is shown in Fig. 3.—Contributed by C. G. Carlstrum, Rochester, New York.

Lathe Work in a Milling Machine

From the history of machine tools we learn that the early milling machine was a modified form of lathe without

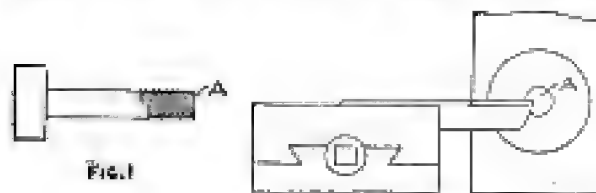


FIG. 1

FIG. 2

Cutter in the Vise

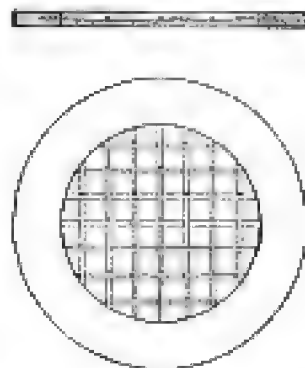
the long bed and the tailstock. In shop practice today it is of common occurrence to see the lathe doing the work

of the miller, and vice versa. An instance of lathe work done in a milling machine is as follows:

We had several thousand screws of the shape shown in Fig. 1. These had been made on an automatic screw machine. They had to be within less than .001 in. of the specified length, which, as they were all over size, meant facing off one end. Ordinarily this would have been a lathe job, but no lathe was available at the time. An unused milling machine was made to take the place of the lathe. The screws were held in the chuck on the nose of the milling-machine spindle, each one being set against a positive back stop. They were then faced off on the small end by a regular side tool. The arrangement is shown in Fig. 2. The job was finished as quickly as if done on a lathe.—Contributed by Donald A. Hampson, Middletown, N. Y.

An Open Stove Plate

The stove plate shown in the sketch is used for setting small utensils on to keep them from falling into the fire. To make this plate, cut a ring pattern to fit the stove



cover and procure a piece of $\frac{1}{2}$ -in. mesh screen made of about No. 10 gauge wire. Cut the screen to almost the outside diameter of the plate. Take the pattern and screen to a local foundry and have the molder lay the screen between the mold parts. When the metal is poured and the casting finished, the screen will be solidly fastened in the iron ring, making a plate that one would hardly part from after once using it.—Contributed by Henry C. Ronfeldt, Toledo, Ohio.

Pianos should never be set against an outside wall as dampness is apt to rust the strings.

The Repair and Care of Lubricators

Loose lubricator brackets not only cause serious leaks of oil and water where they screw into the lubricator body, but are also the cause of the aggravating and dangerous breakage of sight-feed and register glasses.

The brackets can be securely and permanently tightened by inserting a thin copper gasket (Fig. 1) between the bracket joint and its seat in the body. The bracket is turned into line with the one above or below against the jacket, which, as it is squeezed against the body, makes the joint tight and holds the bracket rigidly in place.

Worn choke or reducing plugs are not only a source of trouble in the operation of the lubricator, but cause the excessive use of valuable oil. A number of lubricators, each of a different type, may be used on the engines about the plant, each lubricator possessing differently constructed choke or reducing plugs. When no extra ones are kept on hand, new ones are often made on a common lathe, necessitating a bit of expensive labor.

The usefulness of a reducing plug can be prolonged considerably by closing the small oil passage, using a hollow punch as shown in Fig. 2. A number of lubricators in a plant having excessively worn reducing plugs can waste a great amount of oil, and the use of a punch for this purpose on

is very liable to break the glass when it is forced to withstand its pressure of water and oil. The two can be lined up very quickly and accurately by the

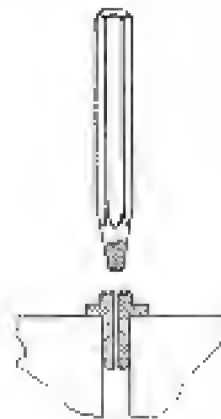


FIG. 2

Closing Passage and Lining Parts



FIG. 3

use of the glass itself as a tool. The opening in the upper bracket through which the glass is inserted is large enough to allow the glass to be swung some distance each side of the bracket below (Fig. 3). By forcibly turning the bracket, through which the glass is inserted, the glass will clear each side of the other bracket an equal distance, at which position the two brackets are correctly in line, permitting the glass to hold its pressure without danger of breaking.—Contributed by F. W. Bentley, Huron, S. D.

Coloring Brass Black

The solution made up as follows is given by Camera Craft for coloring brass articles black: Dissolve blue vitriol in water and add washing soda. Allow precipitate to form and then pour off the clear liquid. The precipitate is carbonate of copper, which, mixed with strong ammonia and heated to 150 deg. F., will stain brass black if dipped in it. Be sure and clean the article well with potash before staining.

Always caliper work when at rest and not in motion.

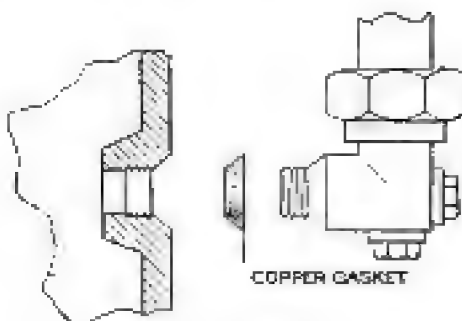


FIG. 1

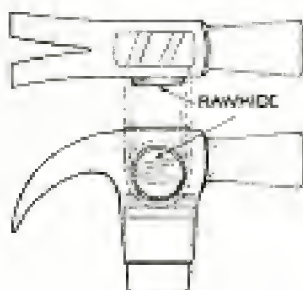
Gasket in Joint

the reducers will result in the saving of money expended for lubricant.

A bracket that is not in line with the one securing the other end of the glass

Combination Hammer and Mallet

A carpenters' hammer with a rawhide insert in the side is a very handy substitute for a mallet. The hammer is removed from the handle and a hole drilled in the side and tapered. A piece of rawhide is shaped to fit the hole and put into place. The hammer is then put on and fastened to the handle. The temptation to drive a chisel with the ordinary hammer is removed, as a mallet and hammer are combined.

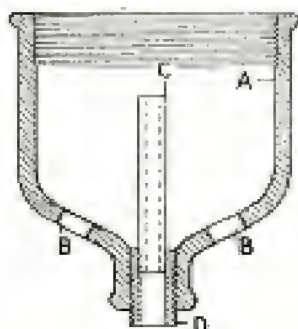


Drilling Dies

Die makers should space off a die with a double-center punch having a space between points equal to any desired number of drill. Alternate holes should be drilled first, after which the intervening holes should be made with a drill having a point to fit into an angle of 45 degrees or less. Such a drill will cut into the holes on both sides without running off, as long as the taper guides the drill. The core will drop out of the die after the last hole is drilled.

Sanitary Drinking Fountain

Ordinary pipe fittings can be arranged to make a sanitary drinking fountain. A reducer, 2 by 1/2 in., forms the main body of the fountain. It is screwed on a water main, D, which has a short extension of 3/8-in. pipe, C. The holes B B



may be of any size to drain the water out slowly. A valve is placed in the pipe below the fountain.

Homemade Hoist for Garages

In all automobile-repair shops there must be some arrangement for hoisting work that is too heavy to be lifted by hand. This is true particularly during the overhauling season, when motors, transmissions, etc., are removed from the frames, and other heavy operations must be performed, says the Motor Magazine of Canada. A device is shown in the sketch to take the place of the more expensive and cumbersome hoisting outfits, and one that can be made easily by the repair man. It will be found equally handy in a private garage, the expense of making being small.

The essential members are two hooked pieces and three rings, two of which are oval in shape. The size recommended for a hook for use on a 6-in. joist is 1 1/2 in. wide by 3/8 in. thick. The metal is forged and holes 1/2 in. in diameter drilled 3/4 in. and 3 in. from the end to receive the links and hinge pin. The hooked pieces are then fastened by a 1/2-in. rivet or cap screw, leaving them free to turn. The oval links go in the end holes and are connected by the other ring, into which is hooked the tackle. The stock for the links is 3/8 in. in diameter, welded into shape, as shown.



In using the device, the hooks are clamped on the timber, the points being driven in with a hammer. The chain hoist is then hung into the lower ring. The greater the strain the deeper the hooks will sink into the beam, thus giving more and more holding power. For use on larger joists, or for holding more weight, this appliance can be larger and heavier to suit the requirements.

Plaster of paris mixed with paper-hangers' paste is the proper material for stopping holes in a plastered wall.

Rust-Proofing Iron and Steel

The metal to be treated is first briefly immersed in a boiling solution of sodium or potassium hydrate to remove oil and grease. If rusty or badly tarnished, it is given the ordinary sulphuric-acid pickle. It is then well washed in clean water, preparatory to the final treatment.

The rust-proofing solution consists of a 4-per-cent solution of phosphoric acid mixed with clean iron filings. It is kept at boiling temperature. The article to be treated is prepared as described and then immersed in the boiling solution for $2\frac{1}{2}$ to 3 hours. The metal will then have a greenish-black appearance. Dry the article and oil it with linseed or paraffin oil. The final color will be gray-black.

Tire-Pulling Tool for Blacksmiths

The tool shown in the illustration is specially designed to remove a steel tire from a felloe without splitting the latter or marring the paint. The sketch clearly illustrates its construction. The size of the material will depend on the work it is intended to do. The several holes in the tire hook make it ad-



Puller on Tire and Felloe

justable for various widths of rims.—Contributed by J. W. Plemons, Circleville, Ohio.

Fruit Cans as Oil Retainers

Empty fruit cans are very handy to have in a small workshop. They can be used for holding oils, paints or small parts. Cut the cover off one of these cans as near the rim as possible, turn over the jagged edges to make them safe for the fingers, and it will make a

fine oil container. Hammer out a place, as shown at A, Fig. 1, and a good spout is formed. These cans are good

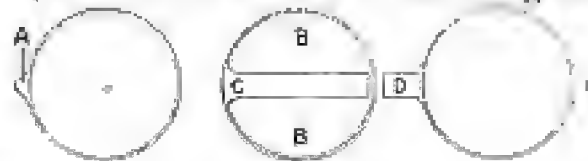


Fig. 1



Fig. 2

Cans with Spouts and Handles

for holding drill compounds on the drill press, or kerosene oil or any liquid that does not require the oil can.

Small-size cans used for condensed milk can have a handle formed of the part C by cutting out the spaces B B. The strip C is turned over to form the handle D. The end E of the handle may or may not be soldered, as desired. —Contributed by Hy. W. Hankin, Troy, N. Y.

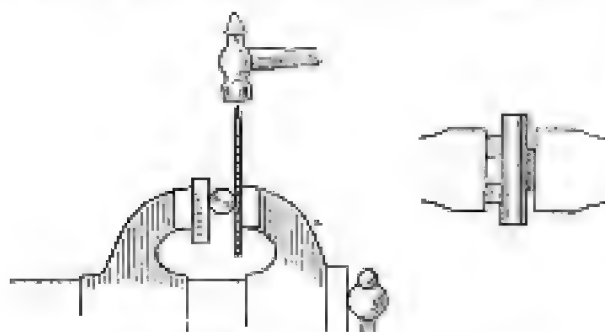
Reversing Bristles in a Brush

Having occasion to use a small varnish brush, I found that it had been put away without cleaning and that the bristles were stuck together in a solid mass. After removing the small nails holding the bristles in the tin binding, I pulled out the bristles and reversed them, forcing the end that was stuck together into the binding, and after replacing the nails I had a brush that was as good as ever and one with which I did a big job of varnishing without a bristle coming out. The ends of the bristles that had been protected from the varnish by the binding were as soft as those in a new brush.—Contributed by W. M. Hope, La Crosse, Wash.

¶An old rat-tail file, ground smooth and rounded to a point on the end and magnetized, makes a useful tool for removing steel particles from the eyes.

Knurling with a File

Take a sharp file and two pieces of square stock; place the file on one side of the piece to be knurled and the

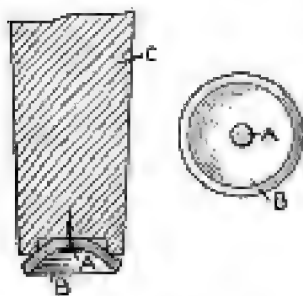


Driving the File through the Jaws

square stock on the opposite side as shown in the sketch. The surface of the file placed against the face of the jaw is ground off and made smooth. Continuous striking on the end of the file causes it to slide down thus rolling and knurling the piece. The square stock gives clearance to the knurl. Sheet-brass jaws will give good results on very small rods, if used in the place of the square stock.—Contributed by J. F. Tholl, Ypsilanti, Mich.

Cushions for Chair Legs

The ordinary felt tips for chair legs can be supplanted by homemade rubber tips as shown in the illustration at less expense of time and money. An



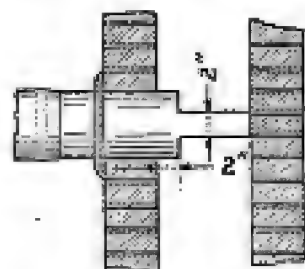
old discarded tire casing will furnish the material from which to cut the rubber disks. The disks B are cut $\frac{1}{4}$ in. in diameter and are attached to the legs of the chair C by boring a hole, $\frac{1}{2}$ in. in diameter and $\frac{1}{8}$ in. deep, in each one and driving a tack, A, in the center. The disks form a cup that makes them stick to the floor without scratching the varnish.—Contributed by John V. Loeffler, Evansville, Ind.

Securing a Fork in a Stag Handle

I had a stag-handle carving fork which came apart and, as it was too good to throw away, I mended it as follows: I warmed the handle by standing it in boiling water, open end up, being careful to keep the water out of the hole. When it was thoroughly hot I poured melted sealing wax into the hole until it was nearly full and then forced the tang of the fork, which I had previously notched with a file, into the wax until the shoulder came against the end of the stag handle. This made a good repair which was not affected by hot dishwater.—Contributed by W. E. Morey, Chicago.

To Keep Pipe from Entering a Flue Too Deeply

When setting up a stove, the pipe always has a tendency to slip into the chimney too far, thus closing off the draft and making the stove smoke. This can be remedied by cutting the pipe to form a projection on each side, as shown in the sketch. The projections should



be just long enough to rest against the opposite side of the chimney when the pipe is in its proper place.—Contributed by P. J. Theisen, Denver, Colorado.

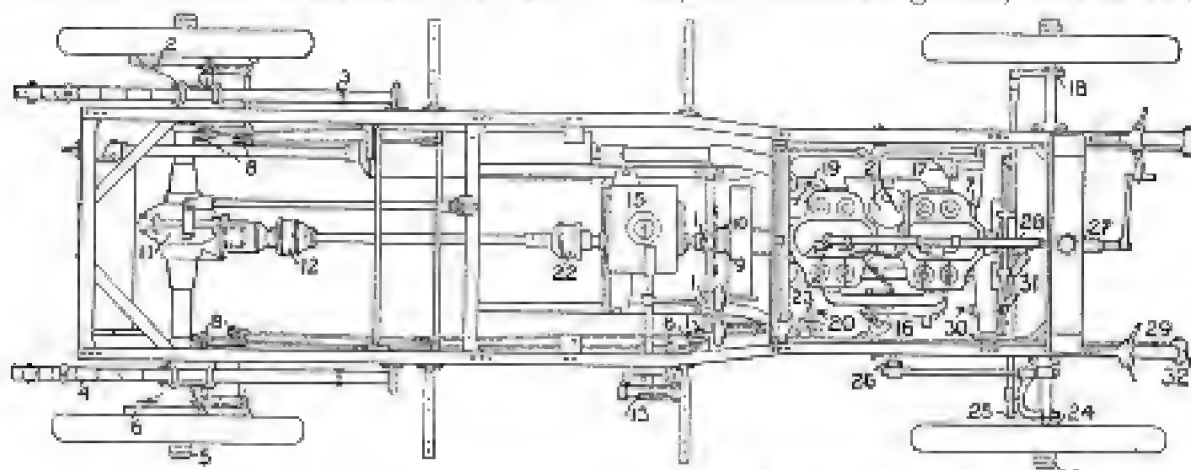
Lubricating an Automobile

In lubricating an automobile, it must be borne in mind that no two automobiles of the same make and model will consume the same amount of oil with the same mileage. This is because the frictional resistance of the bearings will be in proportion to the actual work done, with the load and the condition of roads. While the accompanying

chart and following table of reference will be found simple and convenient, the question of mileage must also be taken into consideration. The oiling time, as shown in the table, is based

Repairing a Flexible Shaft

Clean both ends of the shaft which are to be joined together with gasoline, to remove all grease, oil and dirt.



Plan of an Automobile Chassis with Parts to be Oiled Numbered

upon the maximum work an automobile should do. The table is made up on a monthly basis.

1—Brake-lever shaft bearings.....	Twice
2—Internal-brake cam rollers.....	Once
3—Rear-spring bolt greasers..... (non-fluid oil)	Twice
4—Rear-spring leaves.....	Once
5—Rear-wheel hub caps.....	Once
6—Rear-axle outside bearing greasers.....	
7—Magneto-shaft coupling..... (non-fluid oil)	Weekly
8—Brake fittings and connections.....	Twice
9—Clutch-pedal bearings.....	Weekly
10—Clutch-housing.....	Twice
11—Differential housing..... (non-fluid oil)	Once
12—Rear universal joint.....	Twice
13—Gear-shifter shaft.....	Once
14—Front-wheel hub caps..... (non-fluid oil)	Once
15—Transmission case..... (special non-fluid oil)	Once
16—Air-valve stem.....	Once
17—Magneto oil cups and wells.....	Twice
18—Steering-knuckle bolts.....	Twice
19—Commutator oiler and greaser.....	Once
20—Steering-case greasers..... (non-fluid oil)	Once
21—Crank-case filler and oil tank.....	Daily
22—Front universal joint..... (non-fluid oil)	Twice
23—Valve-rod guides.....	Weekly
24—Front-wheel bearings..... (non-fluid oil)	Once
25—Steering-case tube greasers (non-fluid oil)	Weekly
26—Steering connecting-rod greasers.....	Once
27—Starting-crank bearing.....	Twice
28—Fan-bearing oiler.....	Weekly
29—Front-spring leaves..... (non-fluid oil)	Once
30—Water-pump shaft coupling.....	Twice
31—If shaft has greaser..... (pump lubricant)	Twice
32—Timing-gear compartment..... (non-fluid oil)	Once
33—Spring-bolt greasers..... (non-fluid oil)	Twice

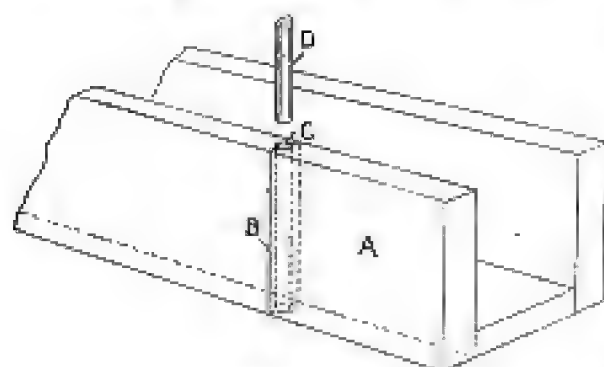
One filling of the differential housing and transmission case will run 1,500 miles. A little oil should be added each month to keep up the proper amount and insure the best lubrication. The crank-case filler and oil tank should be always examined before starting out, to insure a plentiful supply of oil for the trip.

Secure a piece of brass tubing about 4 in. long, no less than $\frac{3}{8}$ in. thick, and a trifle smaller in diameter than the shaft. Split the tubing with a hacksaw all the way down one side so that, when the ends of the shaft are inserted in the tubing, it will expand and make a tight fit around the shaft. Place one end of the shaft in a vise and fasten the other end on a block of wood, making the part to be joined level and rigid. Heat the joint with a blowtorch, being careful not to draw the temper in the brass tubing or shaft. When the joint is hot, pour melted babbit metal in through the split in the brass tube until the babbit sweats itself thoroughly into the ends of the shaft and fills up the seam in the tube. The babbit must be heated until it chars a piece of wood when dipped into it. Dress the joint with a file, and it will be found to work perfectly. As many as four joints of this kind have been made in one shaft, 7 ft. long, with satisfactory results.—Contributed by J. O. E. Dieterich, New York.

¶The atmosphere of a cellar where vegetables are kept is not fit for an incubator. The air is charged with carbonic-acid gas, which is fatal to young chicks.

Water-Tight Joint in Sluices

Laundry tubs, sluices and troughs that are longer than the material used in making them should have the joints



Pin in the Joint

matched as shown in the sketch. The joint is made by squaring the ends of the boards, butting them together and putting a pin between the ends. If the ends are not a good fit, take a saw and cut through the joint, then nail a piece on one side to keep them in line temporarily.

The sketch shows a sluice of which A is the side and B the joint to be made water-tight. If the sides are of 2-in. material, take a $\frac{3}{8}$ -in. bit, long enough to extend through the width of the board, and bore a hole, C, through the joint. Bore a hole in a piece of scrap with the same bit. Cut a pin, D, from soft wood, a trifle longer than the width of the board A, dress it round and just a little larger than the hole bored with the bit, point the end, and then carefully drive the pin through the hole in the scrap. This will make it to size. Drive the pin in the hole C, after the boards are nailed in place, and a perfect water-tight joint is secured.—Contributed by W. A. Lane, El Paso, Tex.

Waterproof Cups for Painters and Decorators

The painter, and especially the sign painter, often has occasion to use a small quantity of one color or another and the color mixed would be of no further use if any were left over.

Furthermore, it would possibly consume valuable time to clean a cup, and different cups for the various tints would take up too much space in a kit. I use a waterproof cup that can be made in any size, and carried conveniently in the paint kit, and is so cheap that it may be thrown away after using.

The cups are made up of oiled stencil board that is not too heavy. The board is cut into pieces $5\frac{1}{2}$ in. long by $2\frac{3}{4}$ in. wide, as shown in Fig. 1. The dotted lines are run over with a blunt knife so that the board may be folded easily without breaking at the folds. After following the measurements in Fig. 1, proceed to shape the cup by folding both ends and sides until the corners meet, as shown in Fig. 2, leaving a triangular flap at each corner. Bend the flaps back on the ends, as shown in Fig. 3. Take the long end and bend down over the flaps, after which push the remaining ends between the triangular flaps; and a neat waterproof cup will be formed. Several dozen cups can be made from the aver-

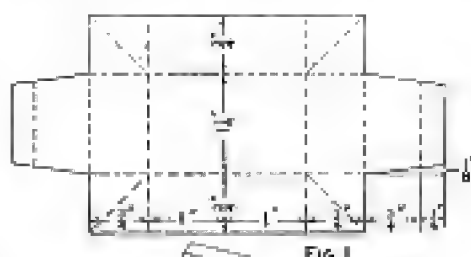


Fig. 1



Fig. 2



Fig. 3

Pattern and the Finished Cup

age-size oiled board. A great many pieces can be cut out and scored ready to be formed into cups and carried flat in the kit, ready for use on any job.—Contributed by Harry Marcelle, San Diego, Cal.

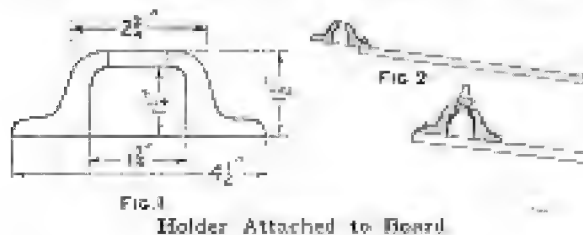
Brass work requires a higher lathe speed than for cast iron or steel.

Using Old Inner Tubes

Do not throw away or sell for scrap old inner tubes, which have sound sections of unperished rubber. By saving the old tubes, and cutting out and sending the sound sections to a tire company, they may be joined into a new tube, says Cycle and Automobile Trade Journal. While this joined tube does not have a good appearance, it will be found capable of giving good service, and when the shoe is put on, only the owner will know how the tube looks.

A Draftsman's Ink-Bottle Holder

A handy ink-bottle holder for a draftsman's slanting board can be made as shown in the sketch. A block of wood is turned up, having the dimen-



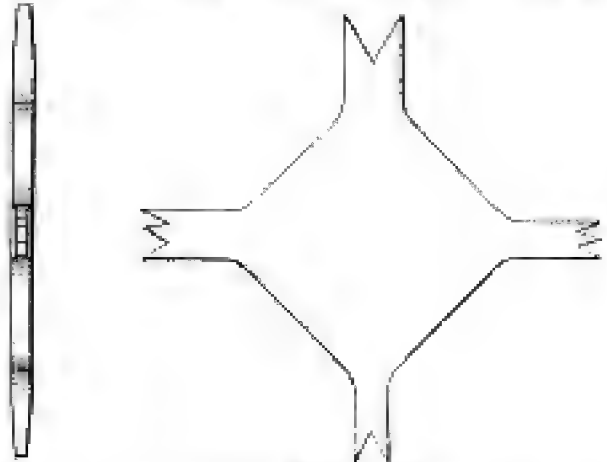
sions shown in Fig. 1. The block is then attached to the upper edge of the board with one screw through the rim so that the holder may swing down over the board as shown in Fig. 2. The ink bottle is slipped into place before turning the block.—Contributed by A. V. Borklund, Cleveland, O.

Removing Small Steel Particles from Brass, Copper or Nickel

Place the piece of brass, copper or nickel in a porcelain dish and add a generous amount of powdered alum. Cover well with water and boil over a fire. It is only a matter of a few hours' time until a small tap, as large as No. 10 size, will be entirely dissolved in this solution. The method is especially adapted for removing broken screws from watch plates.—Contributed by Geo. W. Coplin, Bay City, Michigan.

Lettering Guide

A very handy device for the spacing of title letters on drawings is shown in the sketch herewith. The device is

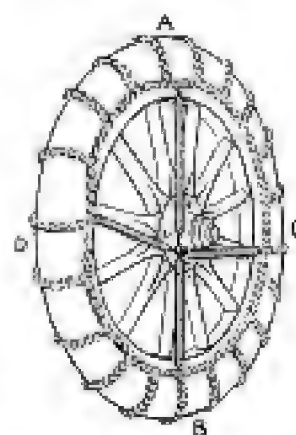


Arms with Different Spaces

the invention of a correspondent of American Machinist. It is made of sheet brass about 3/64 in. thick. The points are filed to a blunt edge, and the spacing of the points may be made to suit the size of the letters used on the drawing.

To Keep Automobile Skid Chains from Rattling

Automobile skid chains can be kept from rattling and clicking by attaching four spiral springs to the holding



chain, as shown in the sketch. Ordinary spiral door springs can be used. The springs are placed across the wheel from A to B and from D to C, the crossing at the center is to one side of the hub. The chains are put on the outside of the wheel so that if they become loose, they will not catch on the machinery. Door springs are inexpensive, and the improvement they will make on skid chains is well worth the price.—Contributed by Earl R. Hastings, Corinth, Vt.

Setting Lathe Tailstock for Turning Tapers

It is sometimes necessary to figure the amount to set over the tailstock in turning a taper where there is no taper-turning attachment. The amount can be determined only approximately by calculations, as it is not known how far the lathe centers enter the piece, and the final adjustment must be made by trial.

When the piece is to be tapered the entire length, the tailstock should be set over the amount obtained by the following rule: Suppose the piece is 8 in. long and the taper per foot is to be $\frac{1}{4}$ in. Divide the taper per foot by 12 which will reduce it to the taper per inch. The problem can be easier worked in decimals. The decimal for $\frac{1}{4}$ in. is .25. Then $.25 \div 12 = .0208\frac{1}{2}$ in., which is the taper per inch. If the piece, is 8 in. long, then $.0208\frac{1}{2}$ in. $\times 8 = .1664\frac{1}{2}$ in. As the tailstock must be set over one-half the amount of the taper, the result is divided by 2. Then $.1664\frac{1}{2}$ in. $\div 2 = .0832\frac{1}{2}$ in., or almost $\frac{5}{64}$ in., a fraction, the amount to set over the tailstock to turn a piece tapering that is 8 in. long with a taper of $\frac{1}{4}$ in. per foot.

It is sometimes necessary to find the amount to set over the tailstock for work tapering its full length when only the two diameters are given, the diameter of the large and small ends of the work. In this case subtract the small diameter from the large and divide by 2. For example: Suppose a piece of work is to be turned tapering its full length, the large end to be 2 in. and the small end $1\frac{1}{2}$ in. in diameter. When subtracted the remainder is $\frac{1}{2}$ in. The $\frac{1}{2}$ in. divided by 2 gives $\frac{1}{4}$ in., or the amount to set over the tailstock.

A tailstock must be set over sometimes for a piece of work, on which only a part is to be tapered. If the diameters of the large and small ends of the tapered portion, the length of the taper and the length of the work is given, then proceed as follows: Sub-

tract the small diameter from the large diameter of the tapered portion, divide the result by the length of the taper and multiply the quotient by the length of the work; and finally divide by 2. Suppose a piece of work is 12 in. long and only 6 in. of its length is to be turned tapering, the diameter of the large end being 2 in. and the small $1\frac{1}{2}$ in. Using the preceding rule, subtract $1\frac{1}{2}$ in. from 2 in. and the remainder will be $\frac{1}{2}$ in. Dividing the $\frac{1}{2}$ in. by 6 in., the length of the taper, the decimal problem will be $.5 \text{ in.} \div 6 \text{ in.} = .0833\frac{1}{3}$ in. Multiply the result by the full length of the piece, $.0833\frac{1}{3}$ in. $\times 12 \text{ in.} = .9996\frac{1}{3}$ in., and this divided by 2 gives $.4998\frac{1}{3}$ in., or about $\frac{1}{2}$ in., the amount to set over the tailstock.

Then again, on such a piece of work where only the taper per foot and the length is given, the amount to set over the tailstock must be determined as follows: Divide the taper per foot by 12 which reduces the taper to the inch. Multiply this result by the length of the work and divide by 2. Suppose a piece of work 12 in. long is to be turned to a taper of $\frac{1}{8}$ in. to the foot. As the rule states divide the taper per foot by 12. The problem in decimals is, $.125 \text{ in.} \div 12 = .0104\frac{1}{4}$ in., the taper per inch. Multiply this amount by 12 in., the length of the work, and the result will be $.1248\frac{1}{2}$ in. Divide this amount by 2 and the result will be $.0624\frac{1}{2}$ in., or about $\frac{1}{16}$ in., the amount to set over the tailstock. —Contributed by Harold E. Murphy, Westerly, R. I.

Holding Water in a Tank while Replacing Valve

A large tank placed in the back yard and supplying the house with water had a $1\frac{1}{2}$ -in. gate valve in the main line that developed a leak. It was found that a new valve must be put in place of the old one. The

problem was to remove the old valve and put in the new without emptying the tank. The job was accomplished by stopping up the end of the pipe in the tank with a brick covered with clean rags. The rags were tied around the brick which was lowered with a cord into the tank near the pipe opening. When the pipe was disconnected at the union above the valve, the first rush of water drew the rag-covered brick over the end of the pipe and stopped the flow of water. When the new valve was replaced, the brick was removed.—Contributed by L. W. Javete, Honolulu, T. H.

Weighted End on a Pencil

A very useful draftsman's device, to keep a sharpened pencil from breaking when it drops to the floor, may be made in the following simple manner: Take a pencil-point guard and a com-



Steel Point in the Guard

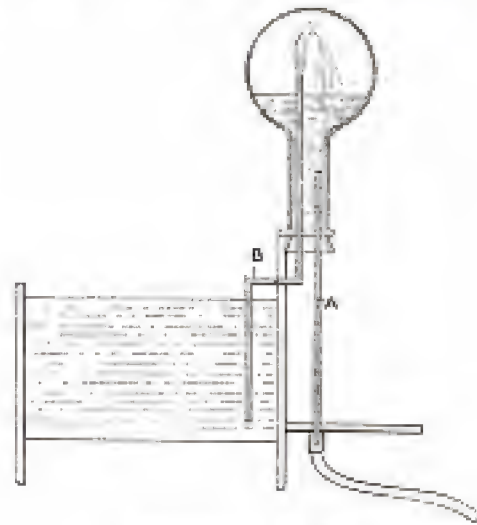
pass point or a point made by filing and hardening a piece of steel wire; notch the large end of this point A to lock it into the solder B, which may be poured into the open end of the thimble, the point being previously forced through the guard from the inside.

When the pencil rolls from the board with the weight on the eraser end, this end will strike the floor first, and the sharp point will stick therein, thus saving the pencil point from breaking.—Contributed by L. L. Williams, Cleveland, O.

A Fountain Window Display

An attractive window display for a drug store or soda fountain can be made of an inverted flask which is supplied with water through tubes in the manner of a siphon, causing a miniature fountain within the flask. The two tubes, A and B, entering the flask

must be of the same size. They are fitted tightly in holes in the cork of the flask. The flask is partly filled with



Fountain in a Flask

water. The relative positions of the tubes must be as shown in the sketch. The flow of water is started the same as a siphon. The waste water, flowing from the tube A, may be caught in a vessel and returned to the tank. —Contributed by W. J. Archibald, New Westminster, B. C.

Face Protector for a Motorcyclist

A good face protector for motorcyclists' use in the winter can be made of a piece of celluloid. The celluloid is cut in the shape shown in the illustration, and a wire, B, is stitched in the edges to keep it from cracking and to hold it in shape, says Motorcycling. Holes for ventilation are cut as shown at A. Elastic bands are attached at the top to go around the head. The lower end C is shaped to be fastened under the coat. Such a protector will not steam or crack in the winter wind.



ⒸThe insulation on fine enameled wire can be easily removed by drawing the wire between a fold in fine emery paper.

Color Harmony in Painting

Color harmony is, or ought to be, a very important subject to the painter, says a correspondent of the Painters' Magazine. A working knowledge of color harmony can be acquired only by long experience.

The primary colors, which cannot be made by mixing two or more colors together are red, blue and yellow. The colors obtained from mixing any two of the primary colors together are called secondary colors. There are three secondary colors, namely, purple, green and orange. Red and blue give purple, blue and yellow make green and red and yellow produce orange.

By mixing any two of the secondary colors together we get what is called the tertiary colors, citrine, olive and russet. Thus, orange and green produce citrine, green and purple make olive and orange and purple give russet. Black and white are not regarded as colors.

A good black can be produced by mixing the three primary colors together in proper proportions. By adding white to any color you produce a tint of that color. By adding black to any color you get a shade of that color. This is the difference between "tint" and "shade." Black subdues or lowers the tone of any color to which it is added.

To preserve the richness of colors when you wish to darken them, use the primary colors instead of the black; for instance, to make a yellow darker, use red and blue; to blue add red and yellow, and so on. Every shade or tint of color required by the painter can be made from red, blue and yellow with black and white.

To make any of the umbers or siennas lighter in color and to preserve the clear richness of tone, always use lemon chrome instead of white. If you want a subdued or muddy umber or sienna color, then use white.

The most useful primary colors

are: Yellows—lemon chrome, deep ocher; reds—vermilion, Venetian red and crimson lake; blues—Prussian blue and ultramarine.

Gold and silver leaf harmonize with all colors, and with black and white in small quantities, and can be used to bring into harmony the most glaring colors.

Some colors never look well on large wall spaces. Blue is not a good color to use in large quantities unless there is a transparent effect obtained by glazing over with a light ground, and even then the effect is depressing. Red on walls makes a room look smaller and absorbs light. Yellows give light and airiness to any room and will reflect light.

The best colors to use in large quantities for churches and public halls are, primrose yellow, terra cotta (white, burnt sienna and lemon chrome), all tints of ocher, flesh color (white and burnt sienna), pea green, apple green, gray-green (white, paris green and a touch of black), ivory shades (white, lemon chrome or ocher), old rose (white, ocher, Venetian red or pure Indian red and black), Nile blue or Nile green (white, Prussian blue, lemon chrome), light citrine, light olive or light russet.

For ceilings, the best tints are the creams, or ivory tints and grays. Creams and ivory tints are made from white tinted with one or more of these colors: lemon chrome, orange chrome, ocher, raw sienna. To produce a warmer tone add a small quantity of burnt sienna, vermilion or Venetian red. To produce a colder tone use a little green, black, raw umber or blue.

Grays are made from white, tinted with either black, black and green, blue and umber, black and red, red and blue or burnt sienna and blue. Light colors are always to be used for ceilings in preference to darker colors.

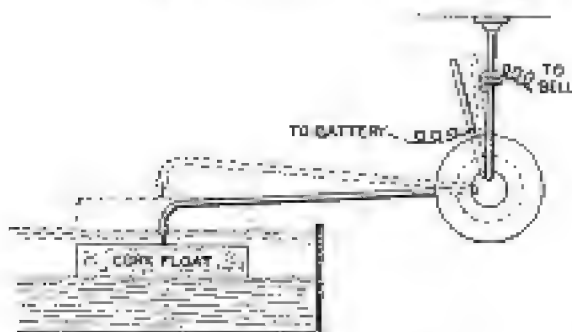
A knowledge of color harmony is

even useful in outside painting. For instance, if you want to find a good color for a trim in contrast to any primary color, use the other two primaries together, thus—principal color used, red; trim, green (blue and yellow). Principal color, yellow; trim, purple (red and blue), and so on, remembering that black and white and shades of gold color can be used for trim to any color.

There is no use trying to mix good clear tints with cheap materials. Only the best goods should be used. It is a good plan to procure a few tubes of artists' colors, imported if possible, as a standard to compare with the colors purchased.

Alarm for a Drip Pan

Being annoyed by the overflowing of the refrigerator drip pan, I attached the small device shown in the illustration to the refrigerator to remind me to empty the pan before it would overflow. A cork float and a common spool with wires set into it at right angles comprise the outfit. The whole device was fastened with screws to the under side of the refrigerator. When the float has risen to the top, an electric circuit is formed, which rings a



Battery Connections to the Float

bell. The wires can be lengthened and bent to suit the size and depth of the pan used.—Contributed by Frank W. Preston, Paterson, N. J.

Test the heat of an oven with a piece of bond paper. If the heat turns the paper light brown, the oven is moderately hot.

Type Made of Leather

A printer in a small town, not having large type of the desired size for a job, made up sufficient letters for his



FIG. 1



FIG. 2

Leather Face on a Wood Block

needs from leather glued to blocks of wood. The leather used was the best quality patent leather not less than $\frac{5}{8}$ in. thick. The letter was laid out on the polished side of the leather, as shown in Fig. 1, and then cut out with a sharp knife. Each letter was glued to a block of wood, Fig. 2, making both together type-high, and weighted.

The type so made seemed to spread the ink better, making no air bubbles, and thus eliminating the small white spots usually seen on large ink surfaces.—Contributed by Homer H. Knodle, Decatur, Ind.

Drilling a Hole in the Joint of Two Pieces

Put the pieces to be drilled, one at a time, into the shaper and with a V-shaped tool just mark the work along the centerline the drill is to follow. When the work is put together, there is a very small hole for the center of the drill to follow, says American Machinist. By using a small drill first, to widen out the hole, other drills can be easily held in their course.

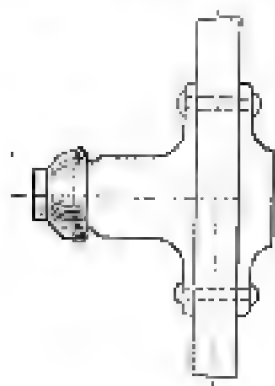
A good paint for ironwork is composed of best French yellow ocher, 39 lb.; lampblack, 1 lb.; raw linseed oil, 54 lb., and Japan drier, 6 lb.

The ways of a lathe should never be used to knock the file on for removing filings.

Fastening Automobile Hub Caps

Place the cap on the hub and drill three holes through the cap and into the hub. Tap these holes for suitable machine screws. The screws will hold the cap securely, and the whole presents a neat appearance.

— Contributed by O. L. Bontz, Greenville, Pennsylvania.



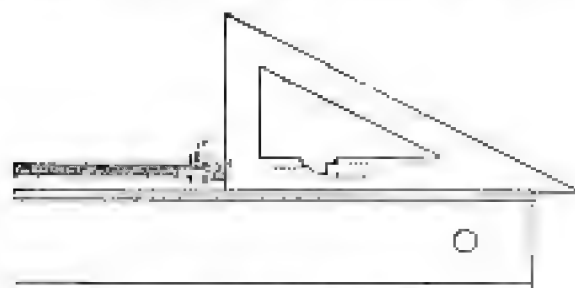
How to Use a Pipe Wrench

Pipe can be very easily crushed with a heavy pipe wrench, if the workman does not understand its use. A correspondent of Power suggests placing the wrench on the pipe and pulling lightly to get the jaw to take hold, then slacking off on the nut until the frame A comes in contact with the handle B at D, as shown in the sketch, thus preventing the jaws from closing. The wrench then has power to turn, but not to jam, the pipe.



Letter-Ruling Triangle

A simple device for ruling a drawing for letters can be made of an ordinary triangle, as shown in the sketch. The notches are cut to the desired



Notch in the Triangle

depth for each line. By placing the point of a pencil in the notches and sliding the triangle along the T-square, light and uniform guide lines may be quickly drawn.—Contributed by C. S. Orcutt, Buffalo, N. Y.

depth for each line. By placing the point of a pencil in the notches and sliding the triangle along the T-square, light and uniform guide lines may be quickly drawn.—Contributed by C. S. Orcutt, Buffalo, N. Y.

A Hardening Mixture

The following mixture produces a temper in tools that will not "bend or break":

White oil	1 gal.
Tallow	4 lb.
Beeswax	1 lb.
Resin	1/4 lb.

Make a brine that will bear up a fresh egg, adding to it 2 oz. of saltpeter and 1 pt. of vinegar for every 12 qt. of brine. Put this into a tank or other suitable receptacle and cover with the above mixture.

For lathe and planer tools, and also for milling cutters, dip into this bath, letting the tools cool in the brine, but do not draw the temper. For tempering springs, the first solution is most excellent. In this case it is used alone without the brine. In the usual manner of tempering springs, dip the work into the solution when it is at the proper temperature. When it has ceased to "sing," hold over the fire and blaze off the oil, then allow to cool in the air.—Contributed by Donald A. Hampson, Middletown, N. Y.

Easy Way of Removing Corks

Corks that have been replaced in bottles are often hard to pull out again. Especially is this true when one is in a hurry and has neither the time nor patience to hunt for a corkscrew or a knife. To remedy this, take, before replacing the cork, a piece of thin white cloth about 3 in. square, and wrap the cork in it, tying it at the top with a piece of twine and allowing the cloth to extend far enough to take hold of with the fingers. The cork may be then easily removed.—Contributed by Louis Fisher, Kansas City, Mo.



Self-Lighting Arc Searchlight

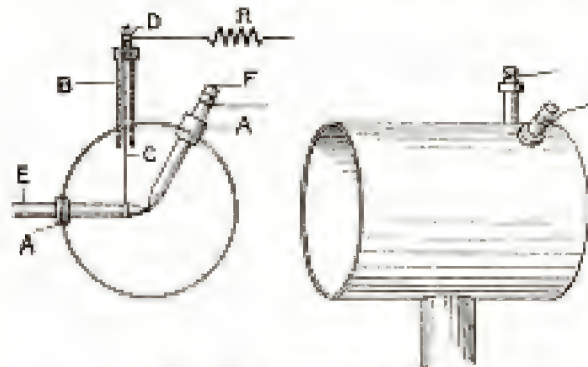
A practical and easily constructed self-lighting arc searchlight can be made in the following manner: Procure a large can, about 6 in. in diameter, and cut three holes in its side about 2 in. from the back end, and in the positions shown in the sketch. Two of the holes are cut large enough to hold a short section of a garden hose tightly as shown at A A. A piece of porcelain tube, B, used for insulation, is fitted tightly in the third hole. The hose insulation A should hold the carbon F rigidly, while the carbon E should rest loosely in its insulation.

The inner end of the carbon E is supported by a piece of No. 25 German-silver wire, C, which is about 6 in. long. This wire runs through the porcelain tube to the binding-post D. The binding-post is fastened to a wood plug in the end of the tube. The tube B is adjusted so that the end of the carbon E is pressing against the carbon F. The electric wires are connected to the carbon F and the binding-post D. A resistance, R, should be in the line.

The current, in passing through the lamp, heats the strip of German-silver wire, causing it to expand. This expansion lowers the end of the carbon E, separating the points of the two carbons and thus providing a space between them for the formation of an arc. When the current is turned off, the German-silver wire contracts and draws the two carbon ends together ready for lighting again. The feed can be adjusted by sliding the carbon F through its insulation.

A resistance for the arc may be made

by running the current through a water rheostat or through 15 ft. of No. 25



Arc in a Large Tin Can

gauge German-silver wire.—Contributed by R. H. Galbreath, Denver, Colo.

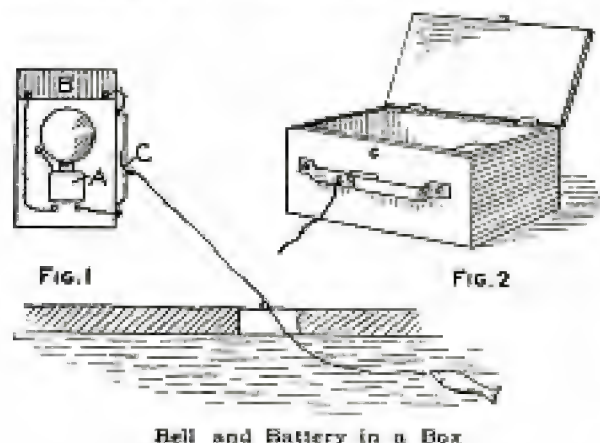
How to Make Small Sprocket Wheels

As I needed several small sprocket wheels and had none on hand, I made them quickly without other expense than the time required, as scrap material was used. Several old hubs with the proper size bore were secured. These were put on an arbor and turned to the size of the bottom of the teeth. Holes were drilled and tapped to correspond to the number of teeth required and old stud bolts turned into them. The wheels were again placed on the arbor and the studs turned to their required size. After rounding the ends of the studs, the sprockets were ready for use and gave perfect satisfaction.—Contributed by Charles Stem, Phillipsburg, N. Y.

Place the transmitting instruments on a wireless outfit as close together as possible.

Fish Signal for Fishing through Ice

Watching a fishline set in a hole cut in the ice on a cold day is very disagreeable, and the usual method is to



have some kind of a device to signal the fisherman when a fish is hooked. The "tipups" and the "jumping jacks" serve their purpose nicely, but a more elaborate device is the electric signal. A complete electric outfit can be installed in a box and carried as conveniently as tackle.

An ordinary electric bell, A, Fig. 1, having a gong $2\frac{1}{2}$ in. in diameter, and a pocket battery, B, are mounted on the bottom of the box. The electric connection to the bell is plainly shown. Two strips of brass, C, are mounted on the outside of the box. The brass strips are shaped in such a way as to form a circuit when the ends are pulled together. The box is opened and set on the ice near the fishing hole. The fish line is hung over a round stick placed across the hole and then tied to the inside strip of brass. When the fish is hooked the line will pull the brass points into contact and close the electric circuit.

Homemade Floor Polisher

A floor polisher is something that one does not use but two or three times a year. Manufactured polishers come in two sizes, one weighing 15 lb., which is the right weight for family use, and one weighing 25 lb.

A polisher can be made at home that

will do the work just as well. Procure a wooden box such as cocoa tins or starch packages are shipped in and stretch several thicknesses of flannel or carpet over the bottom, allowing the edges to extend well up the sides, and tack smoothly. Make a handle of two stout strips of wood, 36 in. long, by joining their upper ends to a shorter crosspiece and nail it to the box. Place three paving bricks inside of the box, and the polisher will weigh about 16 lb., just the right weight for a woman to use. The polisher is used by rubbing with the grain of the wood.—Contributed by Katharine D. Morse, Syracuse, N. Y.

Tying Paper Bag to Make a Carrying Handle

In tying the ordinary paper bag, the string can be placed in the paper in such a way that it will form a handle to carry the package, and also prevent any leakage of the contents. The bag must be long enough for the end to fold over as shown in Fig. 1. The folds are made over the string, as in

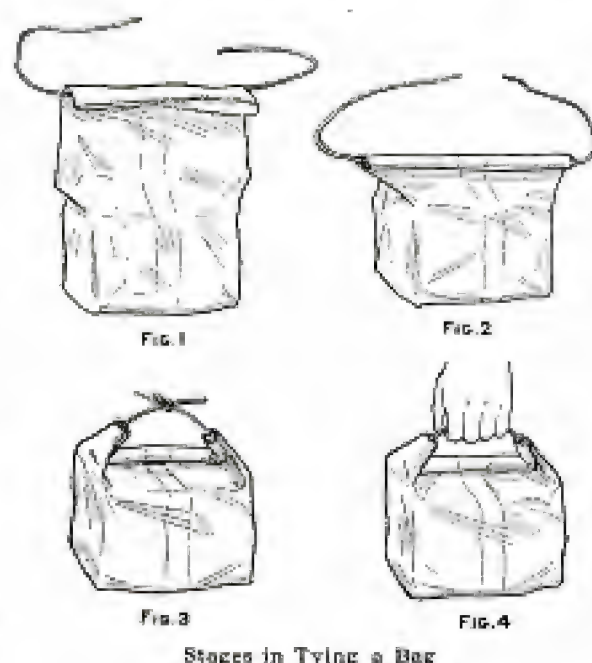


Fig. 2. The string is then tied, Fig. 3, to form a handle, Fig. 4.—Contributed by James M. Kane, Doylestown, Pa.



Making Skis and Ski-Toboggans

During the winter months everyone is thinking of skating, coasting or ski-running and jumping. Those too timid to run down a hill standing upright on skis must take their pleasure in coasting or skating.

The ordinary ski can be made into a coasting ski-toboggan by joining two pairs together with bars without injury to their use for running and jumping. The ordinary factory-made skis cost from \$2.50 per pair up, but any boy can make an excellent pair for 50 cents.

In making a pair of skis, select two strips of Norway pine free from knots, 1 in. thick, 4 in. wide and 7 or 8 ft. long. Try to procure as fine and straight a grain as possible. The pieces are dressed thin at both ends leaving about 1 ft. in the center the full thickness of 1 in., and gradually thinning to a scant $\frac{1}{2}$ in. at the ends. One end of each piece is tapered to a point beginning 12 in. from the end. A groove is cut on the under side, about $\frac{1}{4}$ in. wide and $\frac{1}{8}$ in. deep, and running almost the full length of the ski. This will make it track straight and tends to prevent side slipping. The shape of each piece for a ski, as it appears before bending, is shown in Fig. 1.

The pointed end of each piece is placed in boiling water for at least 1 hour, after which the pieces are ready for bending. The bend is made on an ordinary stepladder. The pointed ends are stuck under the back of one step and the other end securely tied to the

ladder, as shown in Fig. 2. They should remain tied to the ladder 48 hours in a moderate temperature, after which they will hold their shape permanently.

The two straps, Fig. 3, are nailed on a little forward of the center of gravity so that when the foot is lifted, the front



Fig. 1



Fig. 2



Fig. 3—Forming the Skis

of the ski will be raised. Tack on a piece of sheepskin or deer hide where the foot rests, Fig. 4.

The best finish for skis is boiled linseed oil. After two or three applica-



Fig. 4—The Toe Straps

tions the under side will take a polish like glass from the contact with the snow.

The ski-toboggan is made by placing two pairs of skis together side by side



Fig. 5—Ski-Toboggan

and fastening them with two bars across the top. The bars are held with V-shaped metal clips as shown in Fig. 5.—Contributed by Frank Scobie, Sleepy Eye, Minn.

Homemade Life Preserver

Procure an inner tube of a bicycle tire, the closed-end kind, and fold it in four alternate sections, as shown in Fig. 1. Cut or tear a piece of cloth into strips about $\frac{1}{2}$ in. wide, and knot them together. Fasten this long strip of cloth to the folded tube and weave it alternately in and out, having each



Fig. 1

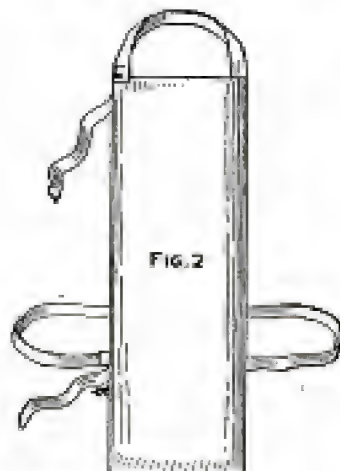


Fig. 2

Inner Tube and Cover

run of the cloth about 4 in. apart, until it is bound as shown in Fig. 1.

Make a case of canvas that will snugly fit the folded tube when in-

flated. The straps that hold the preserver to the body may be made of old suspender straps. They are sewed to the case at one end and fastened at the other with clasps such as used on over-all straps. The tube can be easily inflated by blowing into the valve, at the same time holding the valve stem down with the teeth. The finished preserver is shown in Fig. 2.

How to Make Boomerangs

When the ice is too thin for skating and the snow is not right for skis, about the only thing to do is to stay in the house. A boomerang club will help to fill in between and also furnishes good exercise for the muscles of the arm. A boomerang can be made

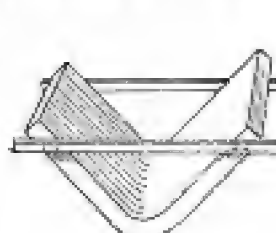


Fig. 1

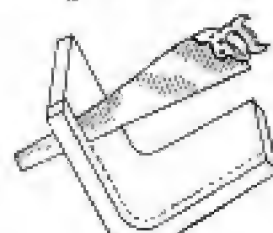


Fig. 2

Bending and Cutting the Wood

of a piece of well seasoned hickory plank. The plank is well steamed in a wash boiler or other large kettle and then bent to a nice curve, as shown in Fig. 1. It is held in this curve until dry, with two pieces nailed on the sides as shown.

After the piece is thoroughly dried out, remove the side pieces and cut it into sections with a saw, as shown in Fig. 2. The pieces are then dressed round. A piece of plank 12 in. wide and 2 ft. long will make six boomerangs.

To throw a boomerang, grasp it and hold the same as a club, with the hollow side away from you. Practice first at some object about 25 ft. distant, and in a short time the thrower will be able to hit the mark over 100 ft. away. Any worker in wood can turn out a great number of boomerangs cheaply.—Contributed by J. E. Noble, Toronto, Ontario.

How to Make an Eskimo Snow House

By GEORGE E. WALSH

Playing in the snow can be raised to a fine art if boys and girls will build their creations with some attempt at architectural skill and not content themselves with mere rough work. Working in snow and ice opens a wide field for an expression of taste and invention, but the construction of houses and forts out of this plastic material provides the greatest amount of pleasure to the normally healthy boy or girl.

The snow house of the Eskimo is probably the unhealthiest of buildings made by any savage to live in, but it makes an excellent playhouse in winter, and represents at the same time a most ingenious employment of the arch system in building. The Eskimos build their snow houses without the aid of any scaffolding or interior falsework, and while there is a keystone at the top of the dome, it is not essential to the support of the walls. These are self-supporting from the time the first snow blocks are put down until the last course is laid.

The snow house is of the beehive shape and the ground plan is that of a circle. The circle is first laid out on the ground and a space cleared for it. Then a row of snow blocks is laid on the ground and another course of similar blocks placed on top. The snow blocks are not exactly square in shape, but about 12 in. long, 6 in. high and 4 or 5 in. thick. Larger or smaller blocks can be used, according to size of the house and thickness of the walls.

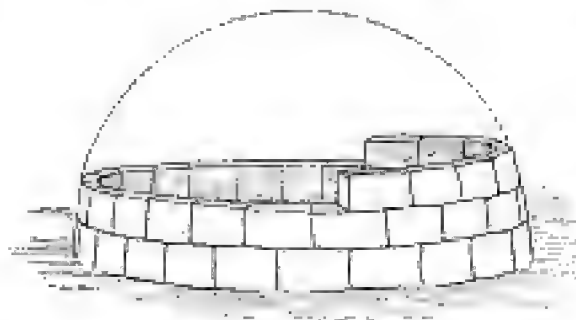
First, the snow blocks must be packed and pressed firmly into position out of moist snow that will pack. A very light, dry snow will not pack easily, and it may be necessary to use a little water. If the snow is of the right consistency, there will be no trouble in packing and working with it. As most of the blocks are to be of the same size throughout, it will pay to make a mold for them by forming a box of old boards nailed together, minus the top, and with a movable bottom, or rather no bottom at all.

Place the four-sided box on a flat board and ram snow in it, forcing it down closely. Then by lifting the box up and tapping the box from above, the block will drop out. In this way blocks of uniform

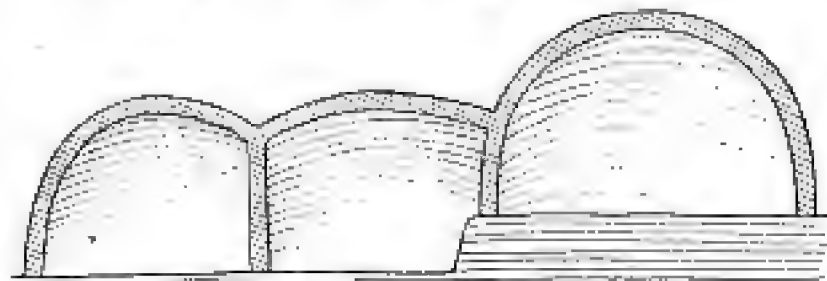
size are formed, which makes the building simpler and easier.

While one boy makes the blocks another can shave them off at the edges and two others can build the house, one inside of the circle and the other outside. The Eskimos build their snow houses in this way, and the man inside stays there until he is completely walled in. Then the door and a window are cut through the wall.

Each layer of snow blocks must have a slight slant at the top toward the center so that the walls will con-



Laying the Snow Bricks



Three-Room Snow House

stantly curve inward. This slant at the top is obtained better by slicing off the lower surfaces of each block before putting it in its course. The top will then have a uniform inward slant.

The first course of the snow house should be thicker than the others, and the thickness of the walls gradually decreases toward the top. A wall, however, made of 6-in. blocks throughout will hold up a snow house perfectly, if its top is no more than 6 or 7 ft. above the ground. If a higher house is needed the walls should be thicker at the base and well up toward the middle.

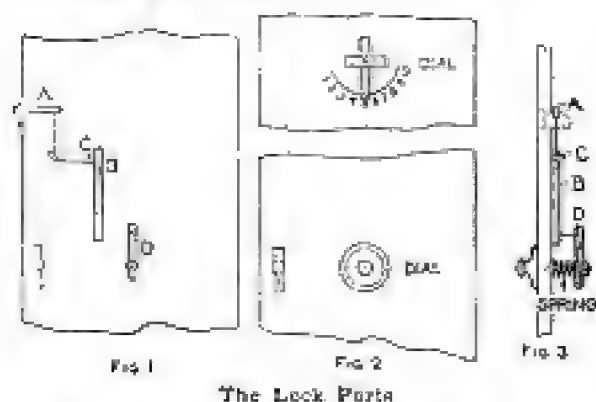
The builder has no mortar for binding the blocks together, and therefore he must make his joints smooth and even and force in loose snow to fill up the crevices. A little experience will enable one to do this work well, and the construction of the house will proceed rapidly. The Eskimos build

additions to their houses by adding various dome-shaped structures to one side, and the young architect can imitate them. Such dome-shaped structures are shown in one of the illustrations.

A fact not well understood and appreciated is that the Eskimo beehive snow house represents true arch building. It requires no scaffolding in building and it exerts no outward thrust. In the ordinary keystone arch used by builders, a temporary structure must be erected to hold the walls up until the keystone is fitted in position, and the base must be buttressed against an outward thrust. The Eskimo does not have to consider these points. There is no outward thrust, and the top keystone is not necessary to hold the structure up. It is doubtful whether such an arch could be built of brick or stone without scaffolding, but with the snow blocks it is a simple matter.

Secret Door Lock

The sketch shows the construction of a lock I have on a door which is quite a mystery to those who do not know how it operates. It also keeps them out. The parts of the lock on the inside of the door are shown in Fig. 1. These parts can be covered so that no one can see them.



The Lock Parts

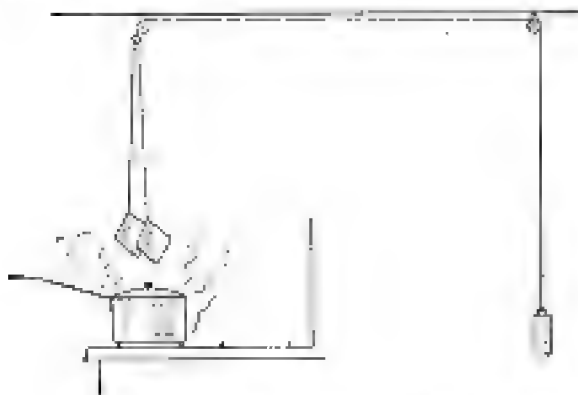
The ordinary latch and catch A are attached to the door in the usual manner. The latch is lifted with a stick of wood B, which is about 1 ft. long and 1 in. wide, and pivoted about two-

thirds of the way from the top as shown. The latch A is connected to the stick B with a strong cord run through a staple to secure a right-angle pull between the pieces. A nail, C, keeps the stick B from falling over to the left. The piece of wood, D, is 6 or 8 in. long and attached to a bolt that runs through the door, the opposite end being fastened to the combination dial. Two kinds of dials are shown in Fig. 2. The piece D is fastened on the bolt an inch or two from the surface of the door to permit placing a spiral spring of medium strength in between as shown in Fig. 3. The opposite end of the bolt may be screwed into the dial, which can be made of wood, or an old safe dial will do. A nail is driven through the outer end of the piece D and the end cut off so that it will pass over the piece B when the dial is turned. When the dial is pulled out slightly and then turned toward the right, the nail will catch on the

piece B and open the latch.—Contributed by Geo. Goodbrod, Union, Ore.

A Convenient Hot-Dish Holder

When taking hot dishes from the stove, it is very convenient to have holders handy for use. For this purpose I screwed two screweyes into the ceiling, one in front of the stove directly above the place where the holder should hang, and the other back of the stove and out of the way. I next ran a strong cord through the two eyes. To one end of the cord I attached a weight made of a clean lump of coal. The cord being just long enough to let the weight hang a few inches above the floor and pass through both screweyes. I fastened a small ring to the other end to keep the cord from slipping back by the pull of the weight. I then fastened two pieces of string to the ring at the end of the cord and attached an iron holder to the end of each string. The strings should be just long enough to keep the holders just over the stove where they are al-



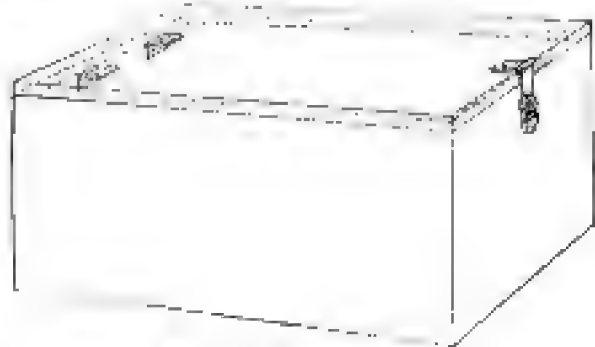
Holders in a Convenient Place

ways ready for use, as the weight always draws them back to place.—Contributed by R. S. Merrill, Syracuse, New York.

Magic-Box Escape

The things required to make this trick are a heavy packing box with cover, one pair of special hinges, one or two hasps for as many padlocks and a small buttonhook, says the Sphinx.

The hinges must be the kind for attaching inside of the box. If ordinary butts are used, the cover of the box



Box with Hinges and Lock

must be cut as much short as the thickness of the end board. The hinges should have pins that will slip easily through the parts.

Before entering the box the performer conceals the buttonhook on his person, and as soon as the cover is closed and locked, and the box placed in a cabinet or behind a screen, he pushes the pin or bolt of the hinge out far enough to engage the knob end with the buttonhook which is used to pull the pin from the hinge. Both hinges are treated in this manner and the cover pushed up, allowing the performer to get out and unlock the padlocks with a duplicate key. The bolts are replaced in the hinges, the box relocked and the performer steps out in view.

A Flour Sifter

When sifting flour in an ordinary sieve I hasten the process and avoid the disagreeable necessity of keeping my hands in the flour by taking the top from a small tin lard can and placing it on top of the flour with its sharp edges down. When the sieve is shaken, the can top will round up the flour and press it through quickly.—Contributed by L. Alberta Norrell, Augusta, Ga.

Can automobile horn with the bulb and reed detached makes a good funnel. It must be thoroughly cleaned and dried after using as a funnel.

Construction of a Small Bell-Ringing Transformer

By A. E. ANDREWS

Part I—Fundamental Principles

The transformer in its simplest form consists of two separate and electrically independent coils of wire, usually wound upon an iron core.

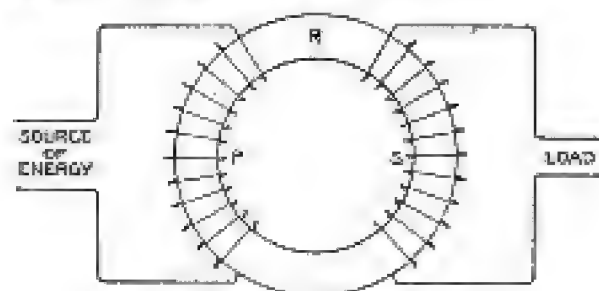


Fig. 1—Two Coils on an Iron Ring

Figure 1 shows two coils, P and S, placed upon an iron ring, R. One of these coils is connected to some source of energy, such as an alternating-current generator, or an alternating-current lighting circuit, receiving its energy therefrom. The other coil is connected to a load to which it delivers alternating current. The coil of the transformer that is connected to the source of energy is called the primary coil, and the one that is connected to the load, the secondary coil.

The electrical pressure (voltage) at which current is supplied by the secondary bears a definite relation to the electrical pressure at which current is supplied to the primary. This relation, as will be explained later, is practically the same as the relation between the number of turns in the secondary and primary coils. If there are a smaller number of turns in the secondary coil than there are in the primary, the secondary voltage is less than the primary, and the transformer is called a step-down transformer. If, on the other hand, there are a larger number of secondary turns than of primary, the secondary voltage is greater than the primary voltage, and the transformer is called a step-up transformer.

The transfer of electrical energy from the primary coil to the secondary coil of a transformer is based upon the

fundamental principles of electromagnetism and electromagnetic induction, and it will be necessary to investigate these principles before we can understand the operation of the transformer.

A magnet is a body, which, when freely suspended, assumes approximately a north and south position. The end of the magnet that points north is called the north pole, while the end that points south is called the south pole. The region surrounding a magnet is called a magnetic field. In this field the magnetism is supposed to flow along a large number of imaginary lines, called lines of force, and these lines are all supposed to emanate from the north pole of the magnet, pass through the medium surrounding the magnet and enter the south pole. The magnetic field surrounding a bar magnet is shown in Fig. 2. The strength of any magnetic field depends upon the number of these lines of force per unit area (square centimeter), the area being taken perpendicular to the direction of the lines.

In 1812, Oersted discovered that a compass needle, which is nothing but a permanent magnet freely suspended or supported, when placed near a conductor in which there was a direct

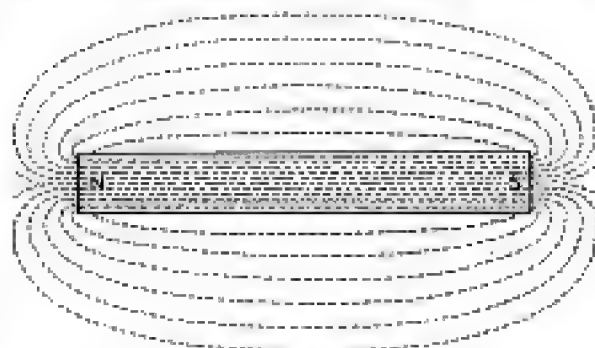


Fig. 2—Magnetic Field

current, was acted upon by a force that tended to bring the needle into a position at right angles to the conductor. This simple experiment proved to

Oersted that there was a magnetic field produced by the current in the conductor. He also found that there was a definite relation between the direction of the current in the conductor, and the direction in which the north pole of the compass needle pointed. If the compass needle is allowed to come to rest in the earth's magnetic field, and a conductor is placed above it, the conductor being parallel to the needle, and a current then sent through the conductor, the needle will be deflected from its position of rest. Reversing the current in the conductor, reverses the direction in which the needle is deflected. If the needle be allowed to come to rest while there is a current in the conductor, and this current is then increased, it will be found that the deflection of the needle will be increased, but not in direct proportion to the increase in the current. Hence the strength of this magnetic field surrounding the conductor depends upon the value of the current in the conductor, and the direction of the field depends upon the direction of the current.

If a conductor be passed through a piece of cardboard, as shown in Fig. 3, and a current sent through it in the direction indicated by the arrow A, a compass needle, moved about the conductor in the path indicated by the dotted line, will always assume such a position that the north pole points around the conductor in a clockwise

direction along a conductor in the direction of the current, the magnetic field will consist of magnetic lines encircling the conductor. These lines will be con-

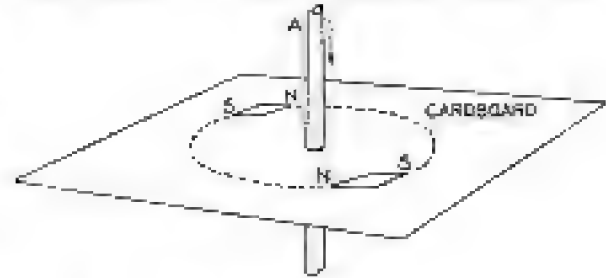


Fig. 3—Magnetic Field around Conductor

centric circles, as a general rule, except when they are distorted by the presence of other magnets or magnetic materials, and their direction will be clockwise.

The strength of the magnetic field at any point near this conductor will depend upon the value of the current in the conductor, and the distance the point is from the conductor. The magnetic field surrounding a conductor is shown in Fig. 4. The plus sign indicates that the direction of the current is from you. The strength of a magnetic field due to a current in a conductor can be greatly increased by forming a coil of the conductor. Each turn of the coil then produces a certain number of lines, and the greater part of these lines pass through the center of the coil, as shown in Fig. 5. The field strength inside such a coil is dependent upon the number of turns in

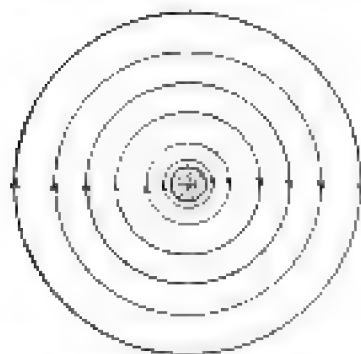


Fig. 4—Magnetic Field Surrounding a Conductor



Fig. 5—Magnetic Field about a Coil

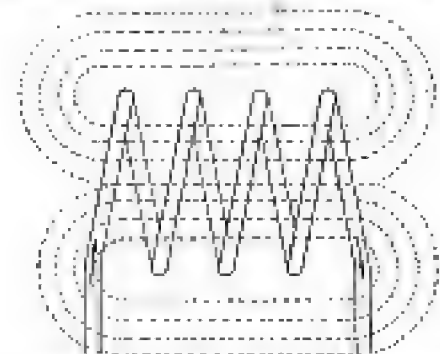


Fig. 6—A Coil about a Magnetic Circuit through Iron and Air

direction as you look down on the cardboard. If the current be reversed, the direction assumed by the compass needle will be reversed. Looking

the coil, and the value of the current in these turns. Increasing the number of turns in the coil increases the number of magnetic lines passing through

the center of the coil, as shown in Fig. 6. If the current be decreased in value, the field strength is decreased, and if the current be reversed in direction, the magnetic field is reversed in direc-

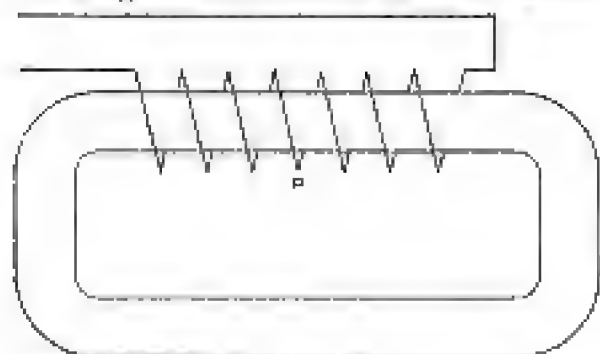


Fig. 7—A Coil about a Magnetic Circuit through Iron

tion. The number of magnetic lines passing through the solenoid depends also upon the kind of material composing the core of the solenoid, in addition to the number of turns and the value of the current in these turns. The number of lines per unit area inside a solenoid with an air core can be multiplied several times by introducing a soft-iron core. If this core be extended as shown in Fig. 7, the magnetic circuit (the path through which the magnetic lines pass) may be completed through it. The larger part of the total number of lines will pass through the iron, as it is a much better conductor of magnetism than air.

In 1831, Michael Faraday discovered that there was an electrical pressure induced in an electrical conductor when it was moved in a magnetic field so that it cut some of the lines forming the field. If this conductor be made to form part of a closed electrical circuit, there will be a current produced in the circuit as a result of the induced electrical pressure. The value of this induced electrical pressure depends upon the number of magnetic lines of force that the conductor cuts in one second. If 100,000,000 lines are cut in one second, an electrical pressure of one volt is produced. The direction of the induced pressure depends upon the direction of the movement of the conductor and the direction of the lines of force in the magnetic field; revers-

ing either the direction of the magnetic field or the motion of the conductor, reverses the direction of the induced pressure. If both the direction of the magnetic field, and the direction of the motion of the conductor be reversed, there is no change in the direction of the induced pressure, for there is then no change in the relative directions of the two. The same results can be obtained by moving the magnetic field with respect to the conductor in such a way that the lines of force of the field cut the conductor.

If a permanent magnet be thrust into a coil of wire, there will be an electrical pressure set up in the coil so long as the turns of wire forming the coil are cutting the lines of force that are produced by the magnet. When the magnet is withdrawn, the induced electrical pressure will be reversed in direction, since the direction of cutting is reversed. A magnetic field may be produced through a coil of wire by winding it on the magnetic circuit shown in Fig. 8. Now any change of current in the coil P will cause a change in the number of magnetic lines passing through S and hence there will be an induced electrical pressure set up in S so long as the number of lines passing through it is changing. The pressure induced in

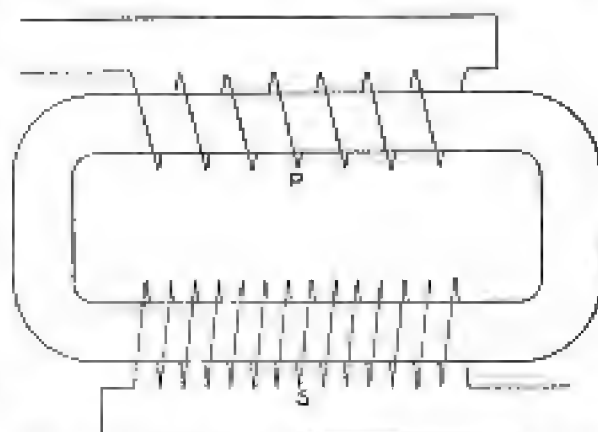


Fig. 8—Two Coils about a Magnetic Circuit through Iron

each of the turns comprising the coil S depends upon the change in the number of magnetic lines through it.

Let us now consider a condition of operation when there is no current in

the secondary coil and the primary coil is connected to some source of electrical energy. When this is the case the current in the primary coil is not determined by Ohm's law, which states that the current is equal to the electrical pressure divided by the resistance, but is considerably less in value, for the following reason. The magnetic lines of force produced by the current in the primary induces an electrical pressure in the primary winding itself, the direction of which is always opposite to the impressed pressure, or the one producing the current. As a result of this induced pressure being set up in the primary, the effective pressure acting in the circuit is decreased. At the same time there is an electrical pressure induced in the secondary winding in the same direction as that induced in the primary.

If the secondary circuit be connected to a load, there will be a current in the secondary winding, which will pass around the magnetic circuit in the opposite direction to the primary current, and as a result will decrease the number of lines passing through the primary coil. This will in turn decrease the electrical pressure induced in the primary coil, and a larger current will exist in the primary winding than there

was before any current was taken from the secondary coil. The decrease in induced pressure is small, but it is always ample to allow the required increase in primary current. There is, at the same time, a small decrease in the secondary pressure.

When the transformer is operating on no load, with no current in the secondary coil, the induced pressure in the primary coil is practically equal to the impressed pressure and hence a very small current will be taken from the source of energy. It is apparent now that if the primary and secondary coils have the same number of turns, the induced electrical pressure in each of these coils will be the same, assuming, of course, that all the magnetic lines that pass through the primary also pass through the secondary coil, and vice versa, or the secondary pressure is practically the same as the pressure impressed on the primary. If the number of turns in the secondary coil is greater or less than the number of turns in the primary, the magnetic lines will be cut a greater or less number of times by the secondary coil, and hence the induced pressure will be greater or less, depending upon the relation of the number of turns in the two coils.

(To be continued)

Spirit Photographs

Print some photographs in the usual way on printing-out paper, then fix them in a solution of 1 oz. hyposulphite of soda and 8 oz. of water, and wash them thoroughly. While the prints are still wet, immerse them in a saturated solution of bichloride of mercury. Be very careful to wash the hands and trays after using the mercury solution, as it is poisonous. When the print is placed in the mercury solution, the picture vanishes completely. Leave the prints in this bath just long enough for the image to disappear, and then wash and dry them thoroughly. Soak some clean blotting paper in the hyposulphite-of-soda solu-

tion and allow it to dry. You are now ready to perform the magic-photograph trick.

To cause the spirit photograph to appear, cut a piece of blotting paper the same size as the prepared print and moisten it, then hold the apparently blank piece of paper in contact with it. The picture will come out clear and plain, and if thoroughly washed out it will remain permanently.

(Saturate a small piece of cotton batting in glue and wrap it around a nail, then place it in a hole previously made in a plaster wall. When the glue dries, the nail will remain permanently.

INTERESTING PATENTS.

FENCE POST AND WIRE FASTENER—A new fence post and wire fastener, comprising a body portion having a plurality of laterally extending tongues disposed in vertical alignment, through which pins are inserted to retain the wires, is shown in Fig. 1. The upper ends of the pins are bent at right angles to limit their movement, and the lower ends are pronged to form spring arms, the arms being bulged centrally to form self-locking means.

DEVICE FOR COOLING FEVER PATIENTS—Figure 2 is a cooling apparatus for fever patients comprising a cooling pipe or hose adapted to be placed adjacent to the body of a person, a smaller section to pass around the head and under the neck, and a supply hose connecting with a receptacle containing cooled water.

WIRE TOOL-HOLDERS—An ingenious arrangement for attaching tools to a belt is shown in Fig. 3. It comprises a series of spring clips, made from one piece of wire, riveted to a thin metal band which may be hooked over any belt. The spring clips may also, taken separately, be screwed into the side of a bench or into a strip of wood above a bench for holding tools in the shop.

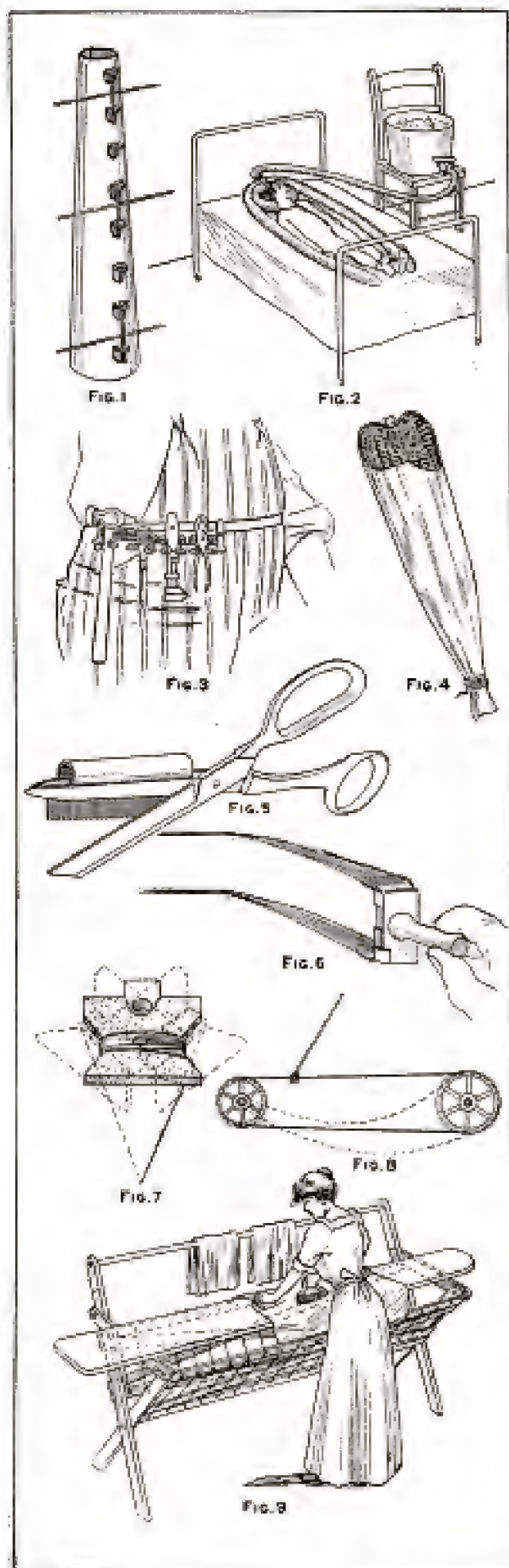
PROCESS FOR PRESERVING CORN—A process of preserving corn, considered by its inventor to be worthy of patent, is shown in Fig. 4. It is a method of hermetically sealing corn husks while on the ear, and consists in tying the husk beyond the small end of the ear, and submerging it first in heated pine tar, then in a quantity of sawdust, whereupon it is finally plunged into air-slaked lime. After the tar submersion the husk is allowed to drain and dry for about two hours.

HAIR CUTTER—A barber's hair cutter, combining a pair of shears and a comb, is shown in Fig. 5. The comb is attached to a clip having a cylindrical barrel, by means of which it is held in position along one blade of the shears. One edge of the barrel clip engages a groove in the face of the blade.

DOUBLE-LINE STRIPER—Figure 6 represents a double-line striping brush, comprising a holder with a pinion, and two brushes slidably mounted upon the holder. Each brush is provided with a rack which engages with the pinion, so that the distance between the brushes may be varied by rotating the pinion.

FLAT ROCKING SPOOL—An interesting new type of spool, claimed by its inventor to be much superior to the ordinary round spool, is illustrated in Fig. 7. This spool is extremely simple, being made of a single flat piece of card or fiber board with a finger hold of tin attached to it. It is claimed to be better than the round spool for unwinding thread by hand, and will also work on the present style of sewing machine without any change, as the hole in the finger hold, at the point where it is attached to the rocking piece, fits the vertical spool-holder shaft of the sewing machine. By taking the serrated finger hold between the thumb and forefinger of the left hand and pulling the thread with the other hand, it easily unwinds, the flat body taking on a rocking motion. The rocking of the body allows the thread to freely slip over the lower corners, first on one side and then on the other. The spool, enlarged of course, may also be used as a holder for hand-fishing lines.

DEVICE FOR REPLACING BELTS—Figure 8 is a device designed for replacing belts, ropes, or other flexible transmissions. For light high-speed machinery, such as are used in clothing shops, round belts or ropes are generally used for connecting the main shaft with the countershaft, and these belts frequently fall off the pulleys. They must be replaced while the shafting and pulleys are in motion and it is quite dangerous to do so by hand. With this device, the operator replaces the belt by taking hold of the rod, slipping the head over the belt, and then moving the rod until the holding member is brought close to the rim of the sheave or pulley, where the rotation of the pulley will naturally cause a movement of the belt. The belt then catches the



PRACTICAL OR UNIQUE

edge of the pulley and slides into position to continue the driving. When the belt is thus caught up by the pulley, it releases itself readily from the holding head, due to the springiness of the sides and the passage with which the latter is provided.

COMBINED FOLDING CLOTHES BASKET AND IRONING STAND—A convenient and useful ironing combination is shown in Fig. 9, comprising a folding clothes basket, a rack, and an ironing-board stand. It can be easily folded and hung up when not in use, and, when set up, becomes a V-shaped clothes basket directly under the ironing board, keeping skirts, sheets, etc., from touching the floor while being ironed.

FISH STRINGER—Figure 10 shows a fish stringer composed of wire links forming a chain, each link consisting of a single piece of spring wire formed into a hook, sharpened at the end. The end of each hook is latched into a keeper formed by a loop of the wire.

ELECTRIC GARMENT—A garment comprising a cloak and hood in one piece, with mittens and foot warmers attached, all electrically heated, is illustrated in Fig. 11. The series of heating coils of insulated wire are woven into the fabric so as to extend around the body and sleeves of the garment and are arranged in horizontal planes.

SCRUB APRON—The scrub apron shown in Fig. 12 is made from a piece of waterproof fabric, and is provided with a felt pad in the form of a strip secured to the inner surface of the apron on a line with the knees.

GUN CLEANER—This gun-cleaning apparatus (Fig. 13) includes a swab in the form of an endless chain, a muzzle member embodying a pulley adapted to support the swab at the muzzle end of the gun barrel; a breach member adapted to support the swab at the breach end, and a driving gear by means of which the swab chain is run through the barrel.

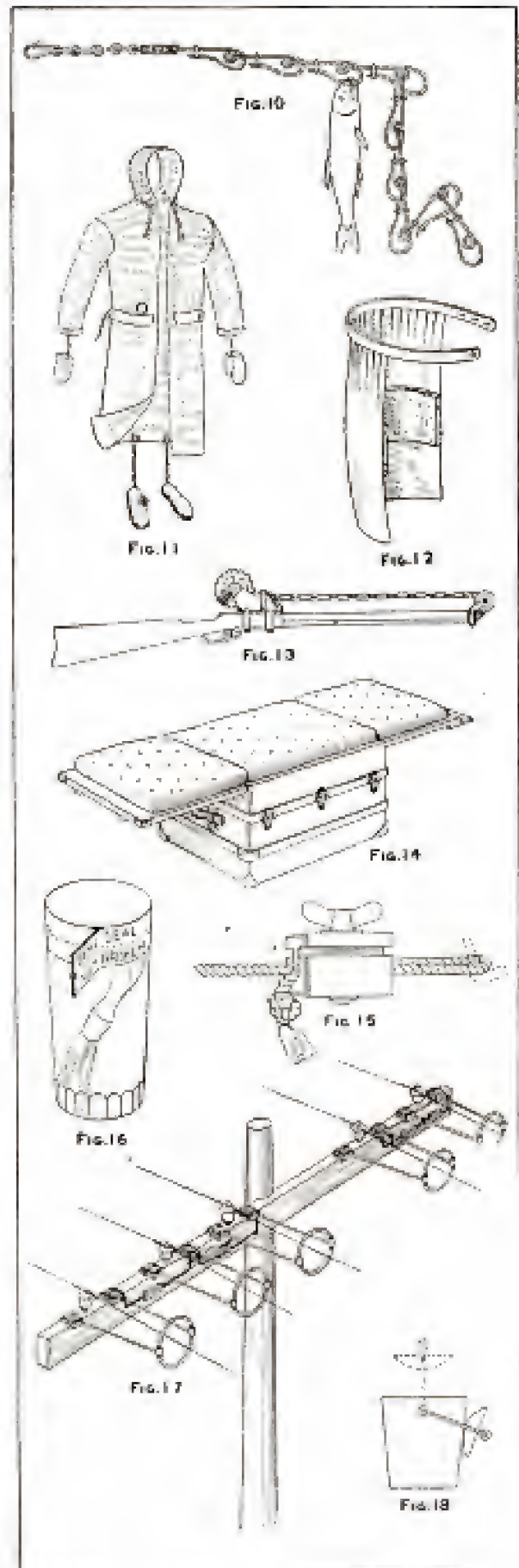
COMBINED TRUNK AND BED—Figure 14 is a combined trunk and bed, or couch, designed for traveling where sleeping accommodations are not always obtainable. The mattress and its support are in three sections attached to and contained in a tray which fits in the upper part of the trunk, the two end supports forming the top wall of the trunk when the couch is not in use. When the blinged ends are thrown back, the middle section rises so that all three sections of mattress have the same level.

CLOTHESLINE CLAMP AND REGULATOR—A simple device for tightening and fastening clotheslines is illustrated in Fig. 15. It is in the form of a clamp which is tightened and loosened by means of a thumbscrew.

PROTECTION SEAL FOR SHAVING CUPS—Men who are shaved in barber shops often provide the barber with a special shaving cup and brush for their individual use, as a sanitary safeguard. Figure 16 shows an additional safeguard in the form of a paper seal for the cup. The cup cannot be used without the breaking of this seal.

GUARD FOR HIGH-TENSION WIRES—Figure 17 shows a type of guard designed for use in combination with high-tension wires. A guard surrounds each wire and is electrically connected with one of the other wires of different potential from the one it surrounds.

GUARD FOR BUCKET HANDLES—A bowl-shaped guard cup or receptacle for bucket handles is illustrated in Fig. 18. It is detachably secured to the bail immediately under the handle piece, and may be swung down with the bail against the side of the bucket.



DR. WOODS HUTCHINSON tells this story: "A hungry typhoid convalescent demanded something to eat. The nurse gave him a spoonful of tapioca.

"Now," he said fretfully, "I want to read a little. Bring me a postage stamp."—*Cosmopolitan Magazine*.

"D. Ogden Mills had many a good story of the old bonanza days," said a San Franciscan. "I liked especially his whisky story.

"A tenderfoot, the story ran, entered a saloon in Arizona and ordered whisky. Whisky in those days and in those parts was a very weird drink. Queer effects were sure to follow it. The tenderfoot knew he must expect something out of the common, but, for all that, he was taken aback when the bartender handed him a small whiskbroom along with the hostile and glass.

"Tenderfoot-like, he didn't care to expose his ignorance by asking what the whiskbroom was for, so he just stood there and fidgeted. He didn't drink. He waited in the hope that somebody would come in and show him what was what.

"Well, in a few minutes a cowboy in a red shirt entered. He, too, ordered whisky, and he, too, got a broom.

"The tenderfoot watched him closely. He poured himself a generous drink, tossed it off, and, taking up his whiskbroom, went over into a corner and carefully cleaned on the floor a space about seven feet by three. There he lay down and had a fit."—*Washington Star*.

The aviator's wife was taking her first trip with her husband in his airship.

"Wait a moment, George," she said. "I'm afraid we will have to go down again."

"What's wrong?" asked the husband.

"I believe I have dropped one of the pearl buttons off my jacket. I think I can see it glistening on the ground."

"Keep your seat, my dear," said the aviator. "That's Lake Erie."—*Youngstown Telegram*.

"Mamma," said Johnny, "if you will let me go visiting with you just this one time I won't ask for anything to eat."

"All right," said his mother. "Get your hat." Johnny, perched on the edge of a big chair, became restless as savory odors came from the region of the kitchen. At last he blurted out:

"There's lots of cake and pie in this house." The admonishing face of his mother recalled his promise and he added:

"But what's that to me?"

Anxious Old Lady: "I say, my good man, is this boat going up or down?"

Deckhand: "Well, she's a leaky old tub, mum, so I shouldn't wonder if she was going down. But then, again, her b'ilers ain't none too good, so she might go up."

A former resident of a Missouri town was asking about the old place.

"I understand they have a curfew law out there now," he said.

"No," his informant answered, "they did have one, but they've abandoned it."

"What was the matter?"

"Well, the hell rang at 9 o'clock and almost everybody complained that it woke them up."—*St. Louis Post-Dispatch*.

Ajax had just defied the lightning. "Ajax, you old fool!" came a feminine voice. "Don't you know enough to come in out of the wet?"

Whereupon he meekly obeyed, as a well-trained husband should.—*Milwaukee Sentinel*.

Satan—What are those two automobile fellows fighting about?

Assistant—They've just got into an argument over whether this place ought to be air-cooled or water-cooled.—*Puck*.

NEW BOOKS

COMPLETE EXPOSURE METHOD AND HOME PORTRAIT HELPS—By Frank Morris Steadman. Contains some valuable hints for the amateur photographer, which will save him much trouble and expense. 40 pages, 5x7, cloth, illustrated. 75 cents postpaid. A. C. & W. E. Wimmering, New York.

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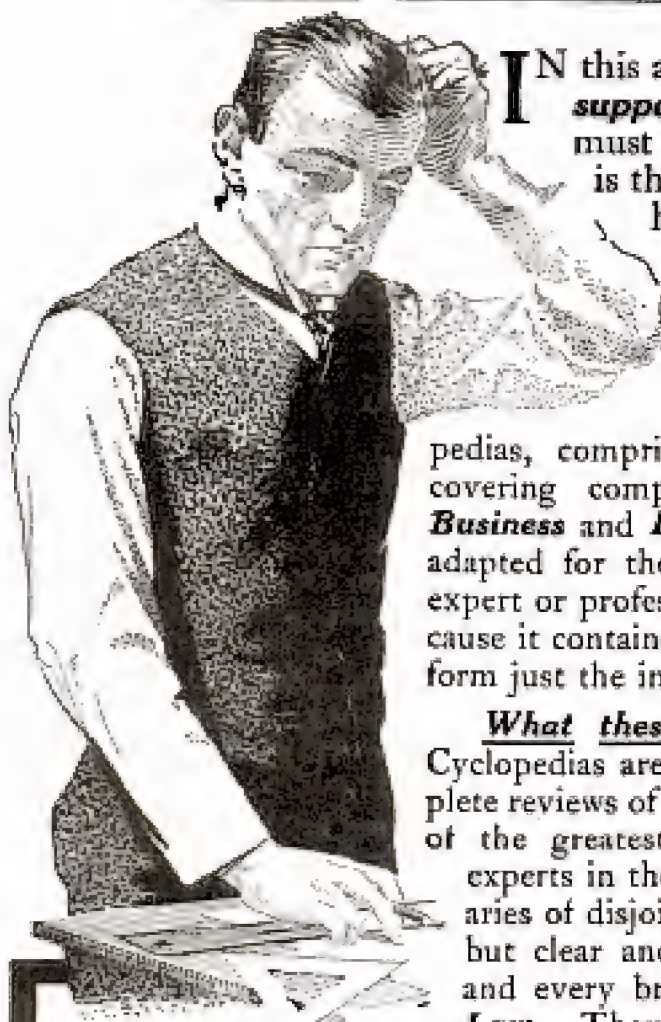
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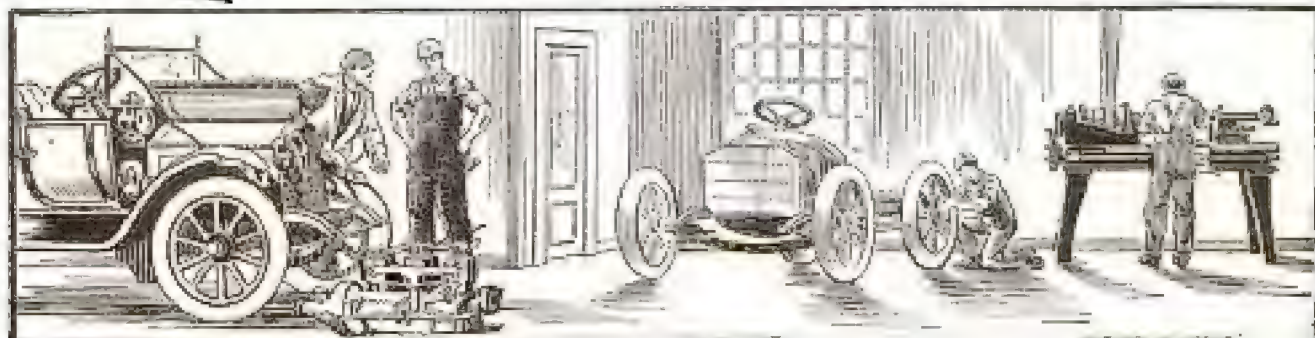
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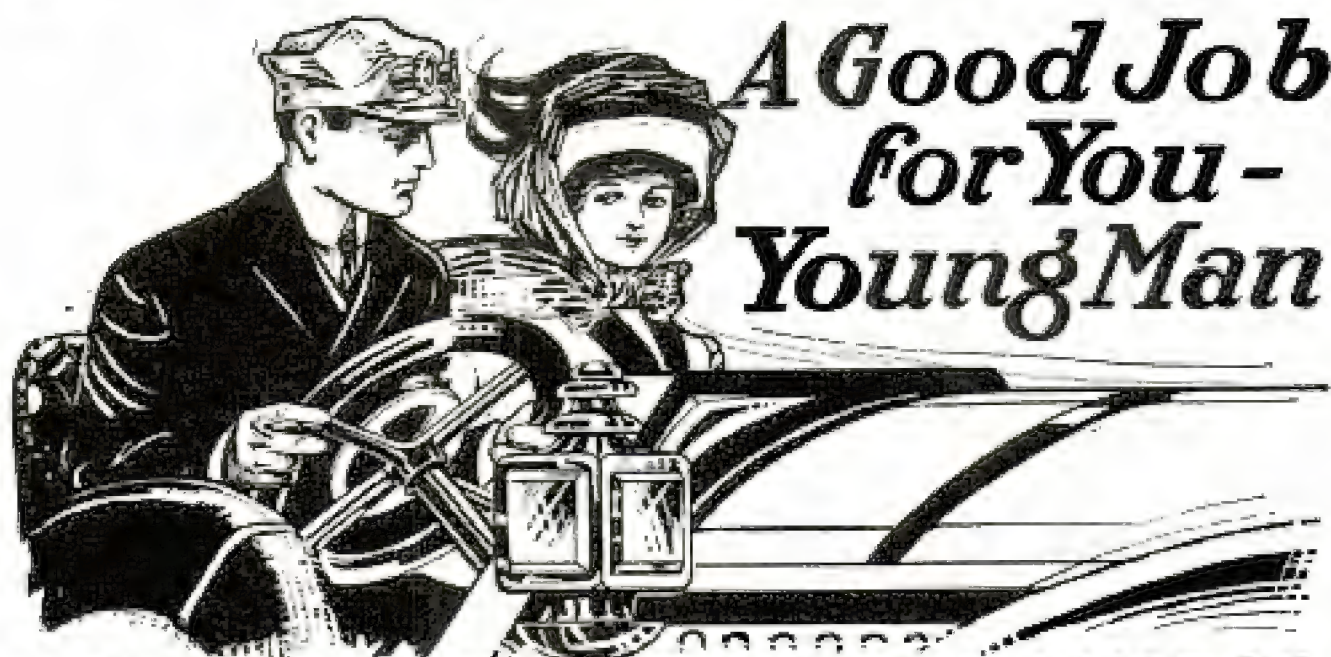
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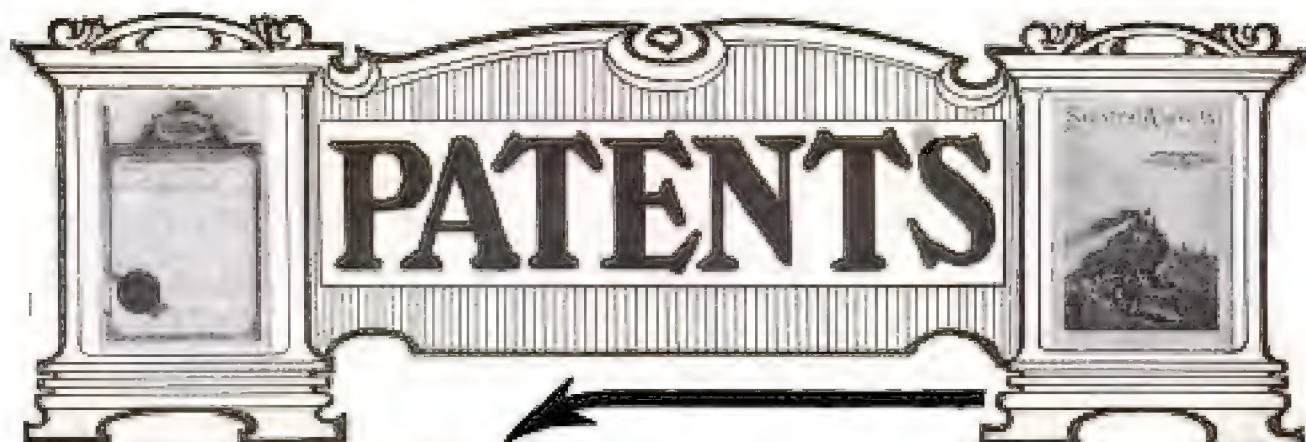
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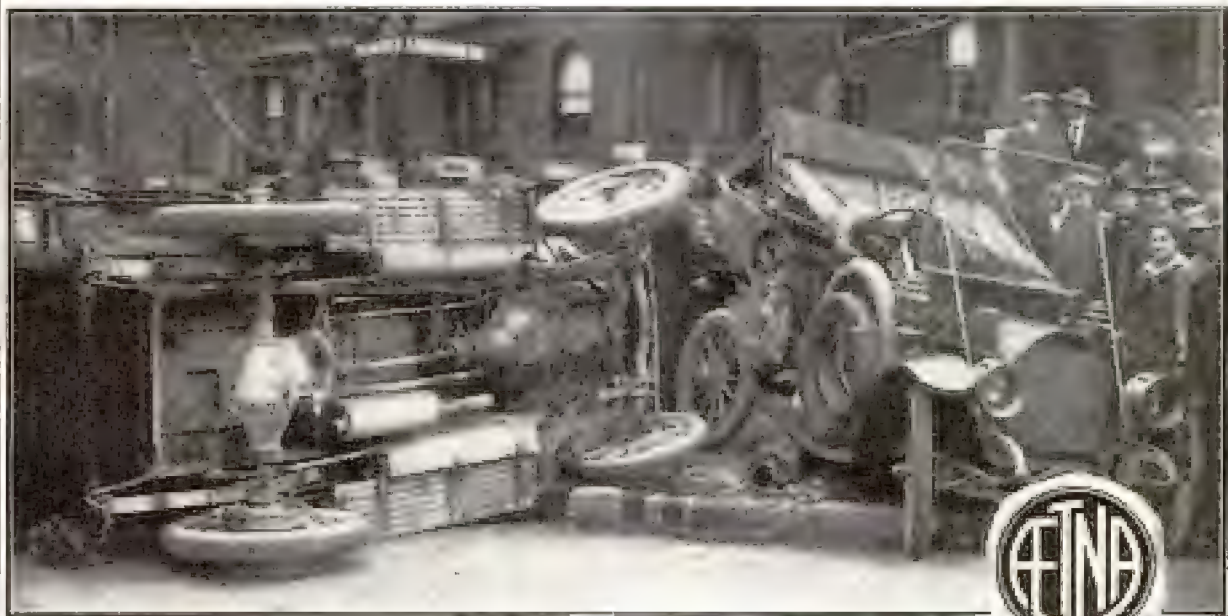
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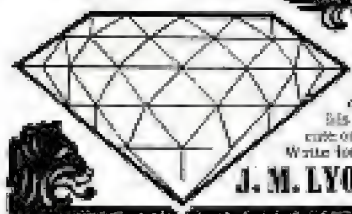
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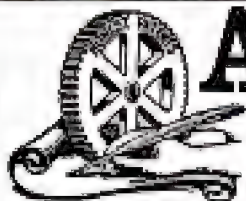
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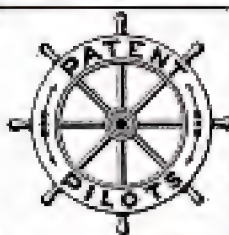
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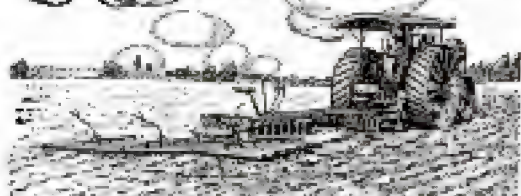


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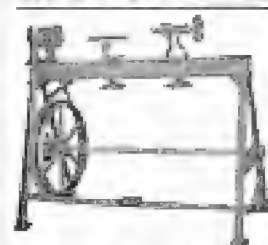
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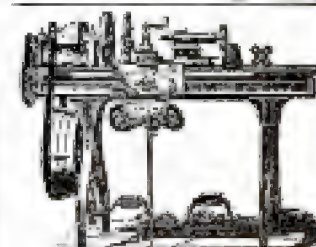
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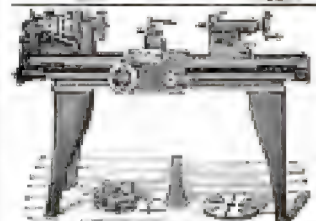
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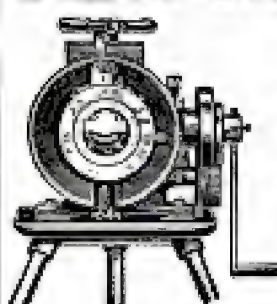
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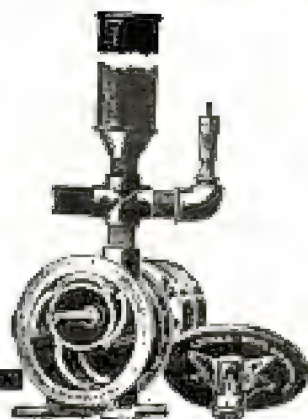
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Catalog No. 23 for vacuums New York, U. S. A.
Sheffield, England—Thos. Ashton, Ltd.; Vienna, Austria—White, Child & Bony

An Assurance of Strength

There is a sense of security in having the best. It is often just the element a man needs to insure that confidence that begets success.

It is such a feeling that comes to a man when he detaches a

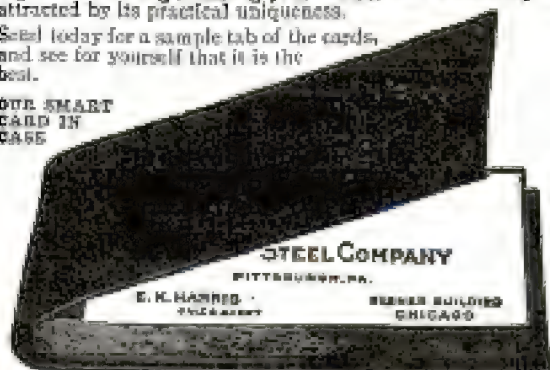
Peerless Patent Book Form Card

and sends it in to the man inside. He knows, while he waits, that he will be well judged because he has the best card. This best card has smooth edges all around after being detached, and the book form and the case insures every card absolutely against dirt or injury.

It embodies every characteristic that could be wished for in a card, and eliminates the inconveniences of a loose card in your pocket or case. Besides there is an exhilaration in using and exhibiting it among your friends who invariably are attracted by its practical uniqueness.

Send today for a sample tab of the cards, and see for yourself that it is the best.

OUR SMART
CARD IN
CASE



The John B. Wiggins Company

Engravers Die Embossers Plate Printers
62-64 East Adams St., Chicago

LET THE RED DEVIL WATER MOTOR DO YOUR WORK

3-inch Motor

Improved construction, absolutely perfect, runs your washing machine and a hundred other things. Power for small tools, $\frac{1}{4}$ horse power on $\frac{1}{4}$ -inch pipe, 80 pounds pressure; 1 horse power on 2-inch pipe, 60 pounds pressure. New net price, \$5.00 cash with order.

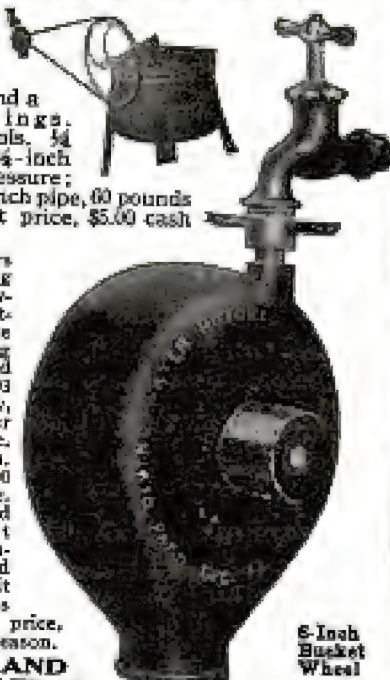
No. 1492 4-inch Motors for grinding, polishing and buffing. Runs sewing machines, fans, bottle washers, etc. Price with emery, buffing wheel, silver polish and pulley, \$1.00. No. 1493 Motor and pulley only, \$2.50. $\frac{1}{4}$ horse power on 80 pounds pressure. Improved construction. Speeds, 3,000 to 5,000 revolutions per minute. Only scientifically and mechanically perfect small water motor manufactured. Patented construction makes it possible. Tremendous output warrants the price. Money back for any reason.

CATALOGUE AND LARGE SHEET FREE

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Dept. T UTICA, NEW YORK, U.S.A.

For the name of your local hardware or tool dealer, we will send you free booklet on "Theory and Design of Water Motors."



8-Inch
Bucket
Wheel

accustomed impudence, strode over to the window, and with a smiling face and a bland manner welcomed his Lordship and inquired where he had been and whether he had enjoyed himself. His Lordship turned slowly around, solemnly fixed his eyeglass in the right position, and remarked: "Pardon, did you address me."

LE PAGE'S GLUE—STRONGEST AND HANDIEST

Hasse, Co. & Co., Gloucester, Mass.

"SPORT ALLURING" A captivating, descriptive booklet about TRAP SHOOTING—the ideal out-door sport.

Address Dept. 348

E. L. DU PONT DE NEMOURS POWDER COMPANY, Wilmington, Del.

500—1-4 H. P. Motors \$20.00 each

Just the thing to run lathes up to 12 inches, drills, buckaws, buffers, grinders, horse clippers, organs, etc. These motors are for electric lighting circuits only for alternating and direct current 110 volts. Send for list of types and prices.

GEORGE BENDER

82-84 Centre St., NEW YORK



=PUMPS=

For Well or Cistern Water
USE ANY KIND OF POWER

Automatic or Hand Controlled
We furnish Tanks, Fixtures, etc.

"JARVIS" 900 River Street
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You May Crowd a Crescent Jointer



to the limit of capacity and the machine will do work just as smoothly as though you had not crowded it at all. Built in six sizes. Send for catalog telling all about them and describing our line of Band Saws, Saw Tables, Planers, Flangers and Matchers, Shapers, Swing Saws, Borers, Disk Grinders, Variety Wood Workers.

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**Red
Debil****Seavey
Mitre Box**

A TWO DOLLAR BILL will put the BEST MITRE BOX made in your Tool Box. The "Red Debil" Seavey is compact, weighs 2 lbs., self-contained, nothing to lose, cuts any angle with any saw, any place, attachable to any thing, in or outside at any time. Over 100,000 sold and in use by mechanics who want to save time, labor, patience and money; are you one of them? All dealers, or remit direct to the makers.

Smith & Hemenway Co., New York, U.S.A.

**The Handiest
Tool Holder Made**

Constructed of hardened steel; accurately machined; and will hold securely, round, flat, square, hexagon, and shaped tools in the tool post, from the largest sized tool down to a No. 60 drill. Write for full particulars, and prices. Satisfaction guaranteed.

B. MORGAN, Manufacturer of SPECIALTIES
Bellevue St., Newport, Rhode Island

**BAR BENDERS**

**For Concrete
Reinforcements**

WRITE FOR OUR
BENDING TOOL
CATALOGUE.

Wallace Supply Co. 124 So. Jefferson St., Chicago
26 Cortlandt St., New York City

"Monsieur le Baron?" compelling his interrogator to repeat his question. The Baron did so, and the answer he received made Lord X, at once the center of interest to the club members present.

"Have been around the world in a steamer playing écarté; bully time, don't you know," said his Lordship.

"Then you have seen all the wonders and all the great cities of the world?" some one inquired.

"No! Beastly nuisance, sightseeing. Just played

MR. HANDY-MAN'S WORK-BENCH

IS NOT COMPLETE WITHOUT

PARKER'S

Pressed Metal Clamp

Liberal
Discount
to
Dealers

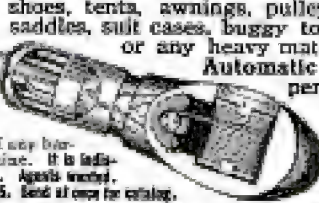
Replaces the antiquated, cumbersome, wood clamp. For mechanics, machinists, wood-workers. Made in 2 1/2 in., 3 in., 3 1/2 in. sizes. Prices, 25c, 35c, 45c, respectively. Mailed post-paid on receipt of price. Special reduction when ordered in quantities.

JOHN L. PARKER CO., Metal Stampings, 62 Jackson St., WORCESTER, MASS.

FOR MENDING HARNESS

shoes, tents, awnings, pulley belts, carpets, saddles, suit cases, buggy tops, dash boards, or any heavy material. **Stewart's Automatic Awl** is the only perfect Sewing Awl.

It takes a vast thread, feeds it from spool and does the work of any harness maker machine. It is indispensable for farmers. Agents wanted. Sent prepaid for \$1.25. Send at once for catalog.



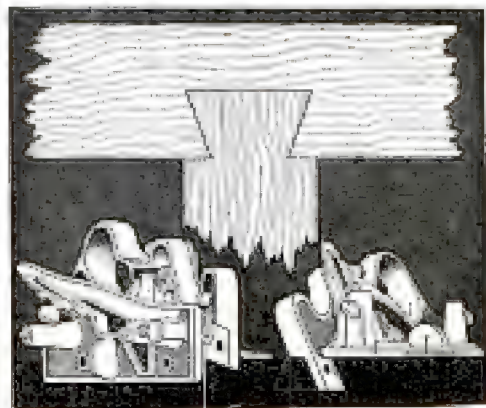
STEWART-SKINNER CO.

26 Hermon Street
Worcester, Mass.



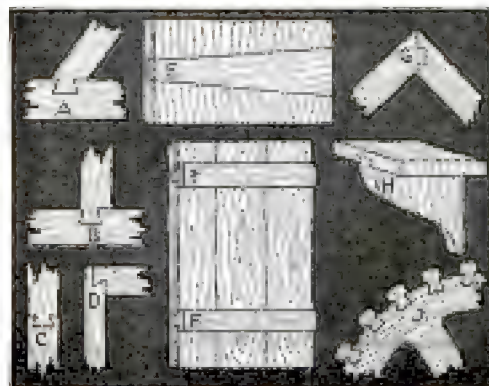
Toolmakers and Machinists. Here's a Portable Tool Case with a convenient arrangement of different sized drawers, all lock lined, with a place for every tool. No need of removing one or two of the others. This Case will pay for itself by saving tools, time and dragging expense. You need one of the many styles shown in our catalogue which we will mail free. No mechanic is up-to-date without a "Gerstner" Case.

Gerstner & Sons

**"444"****Something Entirely New**

A Plane that will at one setting cut a dove-tail groove, and in the other setting, a dove-tail tongue to match.

A most valuable addition to the kit of Pattern Makers, Cabinet Makers, Carpenters and Wood-workers in general.



A few samples of work that can be done with its use.

A circular containing complete description of the tool, as well as valuable suggestions as to the use of dove-tail joints, will be mailed upon request. Address

Stanley
Rule & Level Co.
NEW BRITAIN, CONN. U.S.A.

Get These Attachments For Your "YANKEE" Spiral Ratchet Screw-Driver



Countersink



Screw-eye bit



Screw-holder



HALF ACTUAL SIZE



Chuck with a Drill Point

You will then have a tool that drills holes, countersinks the holes for the screwheads, and drives in the screws—all by simply pushing on the handle. Or it will drill holes, countersink them, drive or draw screws, by ratchet movement.

In short, when you combine the "Yankee" attachments with the splendid efficiency of our "Yankee" Spiral Ratchet Screw-driver, you have a tool of a most unusual range of usefulness.

The Attachments Consist of

- (1) Eight "Yankee" Drill-points for boring holes, $\frac{1}{8}$ to $\frac{1}{4}$ inclusive, and a special chuck for holding the drill-points.
- (2) "Yankee" Countersink, fitting into the tool same as a screw-bit.
- (3) "Yankee" Screw-holder Bit—for holding, placing and driving screws in awkward places.
- (4) "Yankee" Screw-eye Bit.

In addition, you have the three bits—for big, little and medium size screws—which were supplied with your "Yankee" Spiral Ratchet Screw-Driver. The attachments cost little and add greatly to a man's working ability and convenience.

Ask Your Dealer to Show You These "Yankee" Attachments

Write for "Yankee" Tool Book (free) illustrating and describing the many ingenious "Yankee" Tools and their uses. Mighty interesting reading for the mechanically-minded man.

NORTH BROS. MFG. CO.
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LUFKIN

Measuring Tapes

Standards of efficiency for the Amateur and the Expert. The big improvement in markings, instantaneous readings, saves time and avoids error. Send for sample piece of tape and our complete catalogue.

THE LUFKIN RULE CO.
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Sharpen Your Saw

Our Book "Saw Points" compiled by experts will show you the way to get the best results from every kind of a SAW. There is nothing of greater importance than a correct knowledge of the proper care and use of tools among which the SAW, to give the best results, demands the most expert attention—you should write for This **FREE** Book. It will give you a better knowledge of the proper treatment of SAWS.

Send postal for Saw Points Booklet No. 8

CHAS. MORRILL
281 Broadway NEW YORK

scared.

The interest of his hearers became more intense and the members of the club demanded additional information.

"Nothing remarkable, don't you know. Fact is, before Lady X. died, bless her memory, we always played écarté after dinner. Her demise left me lonely. Say, I assure you, I lost interest in my dinner, did not taste right; blamed the cook and butler; meals at club did not taste better; fact, most astonishing. Called in

\$5.00 to \$10.00 A Day Made Easy

The "American" No. 3 Patented

It cuts razors, sharpens all kinds of safety razor blades, clippers, scissors, etc. No make-believe, but the real thing. Complete outfit furnished with instructions how to do the work. No previous experience required. Address, Mfr. Dept. 100, Illinois Cutlery Company, 144 Washington St., Chicago

"The File That Files"

and Wears Best by Test is a

Gold ★ Medal File

Made by
LIVERIGHT BROTHERS
Not in the Trust. PHILADELPHIA, PA.

For Sewing Leather

Get that feel, Natural Tension.

\$1.00 A perfect stitcher. Seams or mends anything. Whole retail shop. Original perfect lock stitch. Diamond point grooved needle pierces thread. Always ready. Sample packet. Agents get busy. Sells on sight. G. A. MYERS CO., 632 1/2 Lexington Ave., Chicago, Ill., U. S. A.

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"Ohio" Tools

Are best for the shop because they are carefully manufactured from best materials and are economical tools for constant use.

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They are best for home use because they require less sharpening and care to keep them in order than most tools on the market.

Insist on your dealer furnishing you "Ohio" Tools—it will pay you.

Write for our free Catalogue of High Grade Tools and Benches

OHIO TOOL CO. (Dept. 3)
Columbus, Ohio



Before you buy, make sure it's a Star Hack Saw Blade

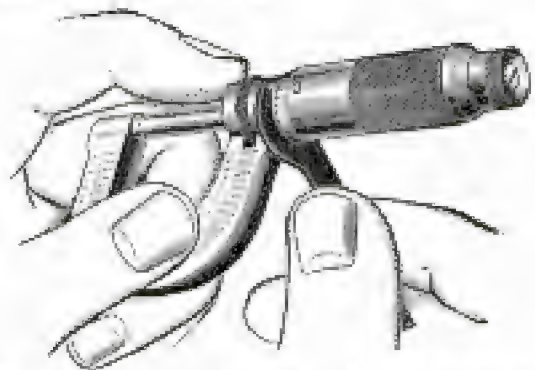
Hack Saw Blades with the Star ★ Trade Mark will stand up to any class of work, cut with every stroke, and have surpassed all Hack Saw Blades in quality and service over twenty-five years.

Star Blades with fourteen teeth to the inch are suitable for all classes of work except tubing with walls less than 1/16 in. thick—for tubing of this thickness, Star Blades with twenty-four teeth to the inch are recommended.

Enterprising dealers everywhere sell Star Hack Saw Blades because they appreciate their strength, durability, and cutting qualities.

Write for a copy of our Free Book, "Tool Practice"

MILLERS FALLS COMPANY 28 Warren Street,
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The Simple Adjustment

of the Starrett Micrometers is a feature that enthralls all mechanics. It takes up any wear quickly and accurately—not by the trial, hit-and-miss way of the movable anvil. This is obtained by placing over the barrel a thin, graduated sleeve, which carries the base or zero line, instead of having it marked on the barrel itself.

If at any time on account of excessive wear, the zero line is not correct, a small turn of this sleeve with a small spanner wrench will remedy the error. A wrench is sent with each Micrometer.

When you see any Starrett Tools you will notice some little difference which makes it better—which makes the Starrett Tools known and trusted wherever accurate work is done.

Catalog 19AP is free. It tells of and illustrates all the fine Starrett Tools.



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The American Combined Level and Grade Finder Most Practical, Durable and Convenient Instrument Made

At one glance you can get the true slant on any line or grade either in degrees, inches or percentage, or all at the same time, and will at once give the exact distance needed to plumb up to a true level. The long-handled recess shown in cut is well worth the low price of the instrument. Write AT ONCE for circular and testimonials. Special Introduction Price given to First Applicants with privilege of taking Agency. Address **EDWARD HELB, Mfr., Box 75, Railroad, PENNA.**

family physician, symptoms bad, ordered to travel. Bill 20 guineas; medical shark. Returned to club for lunch, boy just opened bottle Madeira, association of thought, don't you know. Where should I travel? Told boy telephone doctor, inquire where I should travel; bully interesting, don't you know. Boy came back, said doctor told him to go to—well, you know—the other place—of course, meant the boy, you know—told him tell me, travel abroad. Start at once. Called my banker and valet, left arrangements with them.

GRAB'S WONDER LIGHTER!

Everybody's buying it. The safest, most efficient and economical substitute for dangerous and costly matches. Flashes instantly, lighting any gas or alcohol. Good for 5,000 lights. A household necessity. Simple, durable. Price prepaid only 10c. Think of it. Hurry order. Agents wanted.

VICTOR M. GRAB & CO., 116 Ashland Bldg., Chicago, Ill.

AGENTS

Make \$30 Per Wk.

This AWL sews a lock

stitch like a machine. Best thing ever made for repairing Harness, Shoes, etc. A dozen exclusive features. Demand is immense. Sales astounding. Roy Bagg writes "Rec'd Awl today sold 5 in 15 min." L. Ferraro says "Sold 8 on way home with sample." Lowest price, biggest profit, greatest value, quick sales. Drop everything and write for sample and instructions.

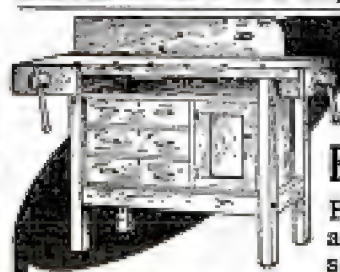
ANCHOR MFG. CO., Dept. 940, DAYTON, O.

GASOLINE SOLDERING IRON BLOW TORCH

Cuts the time and fuel bill!

\$95. Get Booklet today.

EMMELMANN BROS. MFG. CO., INDIANAPOLIS, IND., U.S.A.



Only \$14.50

For this Home Bench

Besides its convenience and usefulness, you will save its price in a year

by doing repair work and "fixing things" that you now pay a carpenter or repair man to do. Thousands of homes have home benches we have furnished—why not you?

Top is 50 in. long, 20 in. wide, with a 13-inch glued-up portion of thick maple

Grand Rapids Hand Screw Co.

620 N. Front St. GRAND RAPIDS, MICH.

THE EXCELSIOR BRAD SET. PRICE 25 CENTS

Takes No. 18
and No. 20
Brads from 1/4
to 3/4 in. long



THIS END IS
MAGNETIZED

The tool illustrated above will be indispensable to the Pattern Maker, Cabinet Maker, or Picture Framer who purchases it. It will set brads in places that would be inaccessible without it, and dispenses with the bradawl and nail set. If, after a fair trial, you are not satisfied that you have received your quarter's worth, your money will be promptly returned to you on receipt of tool. **Standard Tool Supply Co., 42 W. 15th St., New York City**



There's a Carborundum Stone For Every Sharpening Need

For the Carpenter, the Mechanic, the Man-about-the-house, the boy in the manual training school, the housewife in the kitchen,—Carborundum means sharper tools and better work.

Carborundum Sharpening Stones are on sale at hardware stores everywhere—If your dealer does not have them, send direct.

No. 107-H	Round Combination Stone for Carpenters	1.00
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No. 78-H	Knife Sharpener—Oblong, Stag Handle, in neat box	1.00
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Sportsmen will be interested in the book—"How the Doctor got his Bull Moose"—A true story—it's free.

THE CARBORUNDUM COMPANY
NIAGARA FALLS, N. Y.



Temco Electric Drills Offer These Superior Features

Reverse movement of motor permits use of drill for Tapping.

Spindle lock permits tightening of drill in chuck without use of a key.

Capacity—from 0 to $\frac{3}{8}$ in. in metal.

Weight—only 14 pounds.

And You Get Two Drills in One

Because our Drills can be used on Alternating or Direct Current interchangeably. Ask for descriptive booklet.

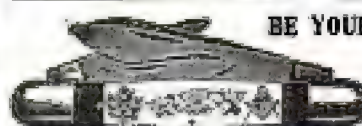
THE TEMCO ELECTRIC MOTOR CO.

LEIPSI, OHIO, U. S. A.

VELVET—The Smoothest Tobacco—10c

Valet read some gazette for travel or something like that, famed tour of the world, steamer leaving Havre following morning, caught mail train and steamer just leaving dock.

"Crowd of tourists on deck—disagreeable common people. Went to smoking room, ordered brandy and soda, another man there, had no match. Steward absent. Man gave me match, talked to same. Man said ecarté good game. My favorite game, too; agreed to play for 50 centimes a game, settle when we landed.



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Make Money Easy

AGENTS wanted in every county to sell the popular Golden Rule Knives with name, address, photo, bridge emblem, etc., on handle. Agents earn \$75 to \$200 a month selling our shavers, transparent handled pocket knives and razors. Big profits, quick sales. Exclusive territory. Experience unnecessary. WE TEACH YOU HOW.

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Try the Wonderful Columbia Kerosene Engine at our Risk

Test it out on your own place for fifteen days. Give it the hardest engine test you can think of. Compare it with any other engine. If the Columbia doesn't develop more power at less cost, send it back quick. No conditions. We are willing to let you be the judge and jury. Kerosene (common lamp oil) is by far the cheapest fuel today. The price of gasoline is climbing all the time, while kerosene remains the same, and in the right engine it lasts longer and produces more power per gallon than gasoline. You get ALL the power when you use a Columbia, because it is the right engine. It is the one really simple and perfect kerosene engine. It never bucks when you need it most. It is always on the job.

Write for Particulars of Our Big Special Offer

We are going to double our output for next year. We can do it easily. It is just a matter of getting engine users to test the Columbia for themselves. So we are making a great special money saving offer on Columbia Kerosene Engines. This offer is liable to be withdrawn at any time, so write today for full particulars, for it is a money saver you would hate to miss. See Book No. 12 full of engine facts you need to know, and free.

Sizes 2 to 15 H.P.

COLUMBIA ENGINE CO., 17 Fuller St.

DETROIT, MICH., U. S. A.

Please Mention Popular Mechanics

THE WIZARD LIGHT



**THE INSTANTANEOUS SYSTEM
REQUIRES NO GENERATION
WHEN YOU WANT LIGHT
JUST PULL THE CHAIN**

**WIZARD
FOUR MANTLE ARC**

**THE "QUICKLIT"
No 30
LIGHTS WITH A MATCH
AS CONVENIENT AS CITY GAS**

THESE latest inventions represent the acme of perfection in artificial lighting. After once installed the instantaneous system requires no generation and can be operated as conveniently as electricity at one-tenth the cost.

The Quicklit Systems are operated as conveniently as city gas, as lamps are lit with an ordinary match.

All our lighting systems represent the highest standard of quality and are fully guaranteed. They are so simple that any one can operate same.

For further particulars and exclusive agency address

THE NAGEL-CHASE MFG. CO., 153 West Ohio St., Chicago, Ill.

TABLE LAMP

canal; saw the Manchester Canal. We now played in deep earnest. We did not break off for luncheon and dinner, but were served at the card table.

"Arriving at Marseilles I was 450 francs ahead. I would like to have visited the city. Gishle books say it's splendid, but I was too interested in the game, and fact, on my honor, landed in Havre; game a draw. Beastly luck. Captain would not continue voyage; said he was jolly glad to land again. See family, baby and all that sort of blooming thing. Said good-bye to man. Arrived Paris this morning. Feel beastly tired, don't

LIGHT AS DAY

Best light from your old kerosene (or any) lamp and lantern than from electricity or gas. Our great WHITE FLAME BURNER in any lamp, burns the oil and develops a brilliant, white, 25 candle power light from a one-wick wick, and never smoking. NO MANTLE TO BURN. Nothing to get out of order. Safe and reliable. AGENTS WANTED. 33 CENTS. MONEY BACK IF NOT SATISFIED. "G.C." LIGHT CO., 500 Baldwin Block, Indianapolis, Ind.



NEW—WONDERFUL Standard-Gillett SAFETY LAMP

Portable—can be placed anywhere. Brightest light known. Twice as bright as electricity. Costs one-fifth of a cent per hour. Beautiful, soft, mellow light; particularly desirable for reading. Base of lamp made of nickel-plated brass. Shades in all colors to suit any taste. Write for illustrated circular No. 380.

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NULITE GASOLINE TABLE LAMP

A complete Light Plant weighing 7 pounds. Portable, absolutely safe, 200 C. P., brilliant light 1/2 cent per hour. Saves 90% of your light bill.

AGENTS—Write for Special Offer on complete line of gasoline lights and systems. Over 200 different styles. Highest Quality. Lowest Prices. Exclusive territory for town, country and traveling salesmen. 72 page illustrated catalog free. Write to-day.

NATIONAL STAMPING & ELECTRIC WORKS
422 S. Clinton St. CHICAGO, U. S. A.



BEACON LAMP FREE BURNER



100,000 satisfied users. Incandescent. 100 Candle Power. Burns common coal oil. Gives better light than gas, electricity or six ordinary lamps at one-sixth to one-tenth the cost. Fits your old lamp. Unequaled for fine sewing or reading.

COSTS ONLY ONE CENT FOR SIX HOURS

We want one person in each locality to whom we can refer new customers. Take advantage of our Special Offer to secure a Beacon Burner FREE. Write today. Agents Wanted.

HONE SUPPLY CO., 248 Bone Building, Kansas City, Mo.

BUY PLUMBING SUPPLIES AT WHOLESALE



Will
Save
You
30%

Don't pay retail prices. Full stock on hand for prompt shipments. Send for free catalog. B. P. K4804, 748 to 752 West Harrison St., Chicago.

TRIUMPH STAND LAMP

A 300 Candle Power Lamp for Home, Store, Shop, work bench, library, desk, or wherever a steady and powerful light is wanted or a lamp can be used. Can be turned up and down like gas, and carried around with more safety than a kerosene lamp, and gives 10 times the light at less than 1/4 the cost to operate, which a child can do. Better than gas or electric lamps because there is no heat or drop wire to prevent their being used anywhere, and will make a most attractive and desirable.



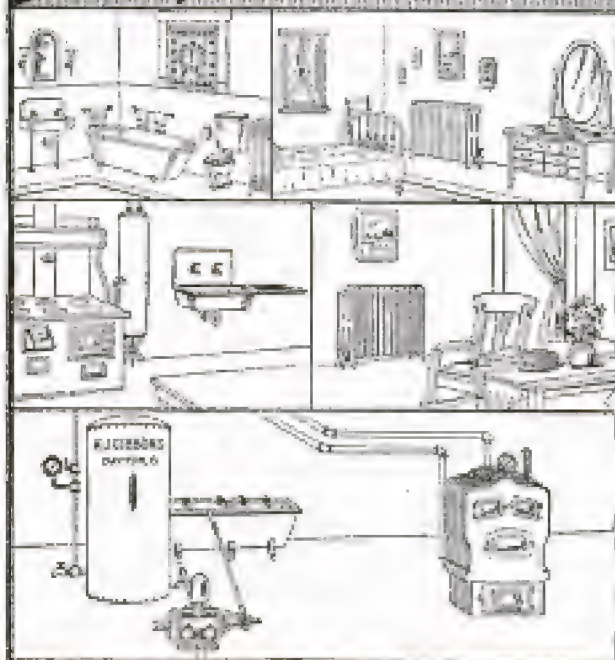
Christmas Present

We have five other distinct lines of gasoline lamps, Hollow Wire Systems, and individual gravity lamps, unequaled by any other house. Every one a success and winner. Our POP Catalog tells all about them. Get it now and decide which line you want.

BRILLIANT GAS LAMP CO.
Dept. 1, No. 182 N. State Street, Chicago, Ill.

RUNNING WATER in your home \$42

Complete Hot-Water and Steam-Heating plants \$120 up



Fresh running water for your bathrooms, kitchen, laundry, stables, gardens. Plants, all sizes, \$42 and up. Operated by hand power, electric motors or gasoline engines.

THIS COMPLETE BATH-ROOM OUTFIT FOR \$38.95

All kinds of plumbing supplies at factory-to-you-direct prices.

Heating Plants—Save \$100 to \$250

on a modern Heating System. Steam Heating Plants \$120 up. Hot water plants \$140 up.

Lighting Plants—Complete Electric Plant, including gasoline engine, dynamo, switchboard and storage battery, \$250.

Important—We will furnish free with every water, heating or lighting plant special plans for your individual home. Anyone can install with these complete drawings.

THIS BIG FREE CATALOG SHOWS THOUSANDS OF BARGAINS. Gasoline Engines, Farm Tanks and Pumps; Hydraulic Rams; Pipes, Valves; Gas and Electric Fixtures. Write for catalog today. Buy from us and save 20 per cent. We have the most complete line of Plumbing, Heating and Lighting goods in the U. S., and we guarantee absolutely everything you buy. Write today for catalog.

M. J. GIBBONS

Dept. A Dayton, Ohio

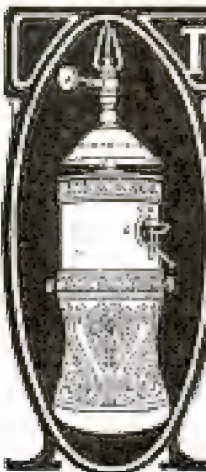


THE "BEST" LIGHT

Makes and burns its own gas. Pure white 40 candle power light, more brilliant than electricity or acetylene, and cheaper than kerosene. Casts no shadow. Costs 2 cents per week per lamp. No dirt, no grease, no odor. Used in every civilized country on earth. Over 30 styles. Every lamp warranted.

Agents wanted. Write for catalog.

THE BEST LIGHT CO.
324 E. 5th St., Canton, O.

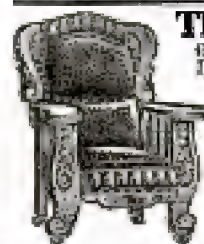


you know.

"Telegraphed doctor, ordered me to travel; telegraphed been around the world, nowhere to go; ordered to marry. Telegraphed banker and bishop, looking for woman. Waiting. That's the whole jolly story."

"But," inquired one man in the room, "who was the man you played with? What is his name?"

Lord X. stared absently out of the window and then slowly turned around. "Pon my word, don't know. You see there was no one to introduce us, don't you know."—Paris Figaro.



This Morris Chair \$125

65c monthly—total price \$3.45. **CASH**
Latest design. Skin dried heavy stock. Genuine Fabricated Leather. We have 3000 such bargains for you. And all

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You use and order the goods now, pay as you can, in 12 or 24 easy payments. **SEND AT ONCE FOR OUR BIG ILLUSTRATED CATALOG. IT'S FREE TO YOU.**

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1678 35th St., Chicago, Ill.

Buy Direct—Save Money—We Pay Freight

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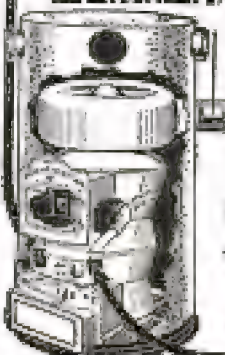
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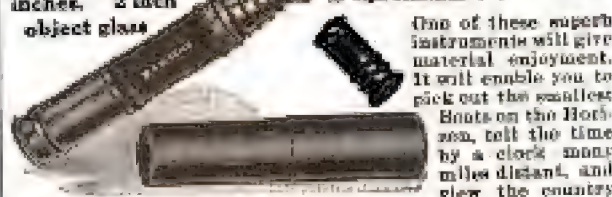
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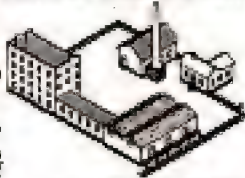
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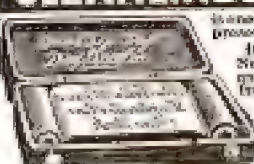
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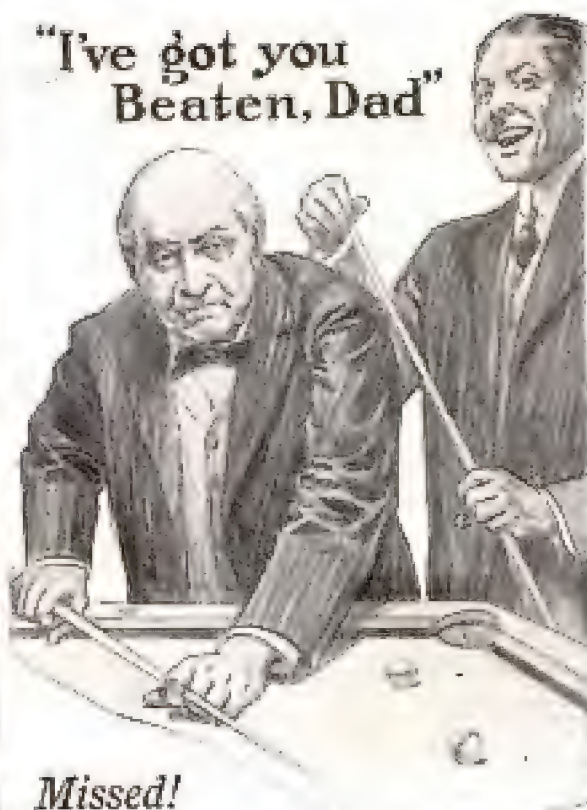
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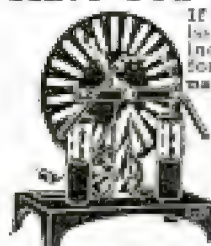
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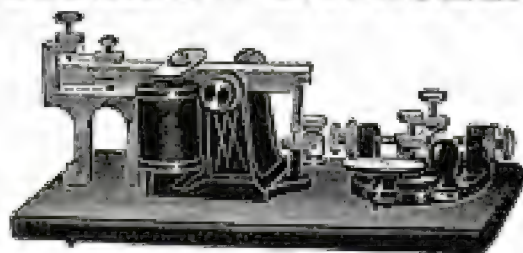
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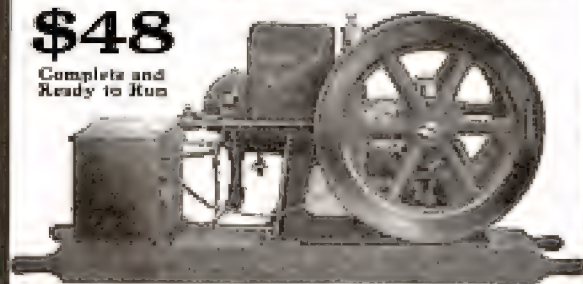
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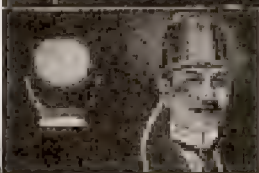
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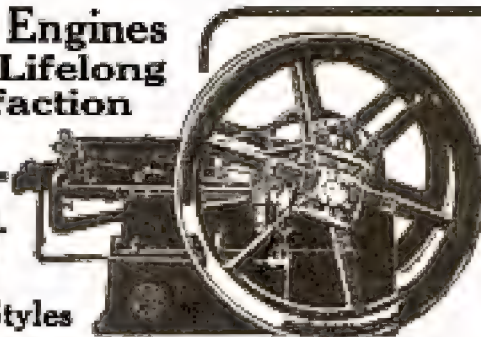
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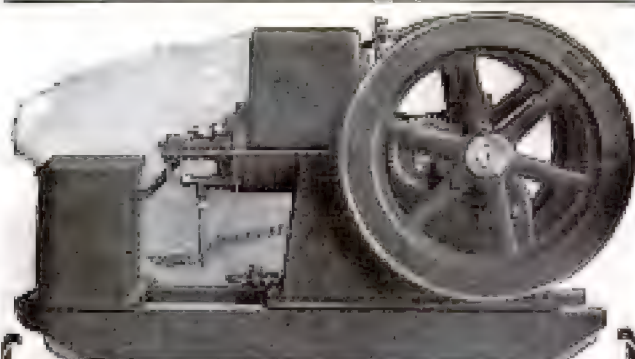
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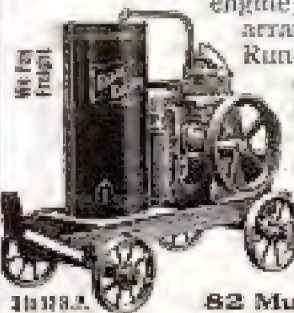
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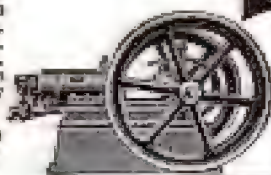
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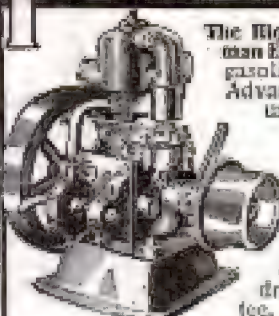
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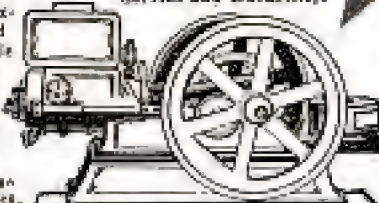
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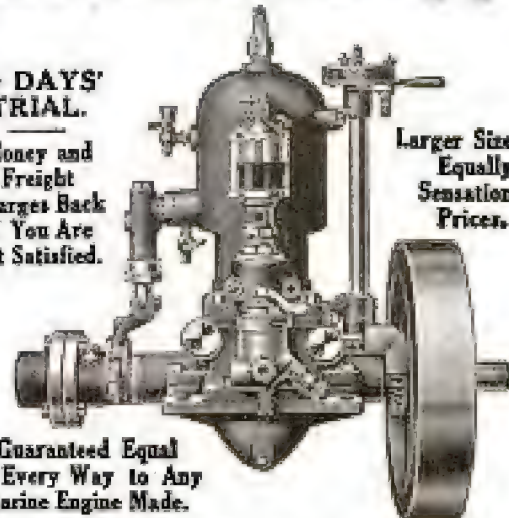
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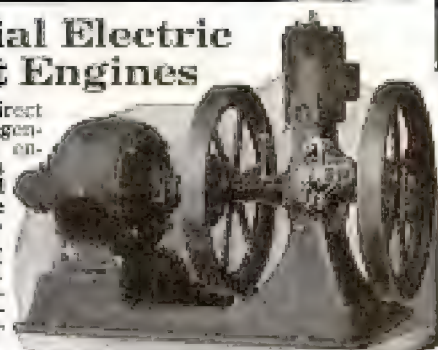
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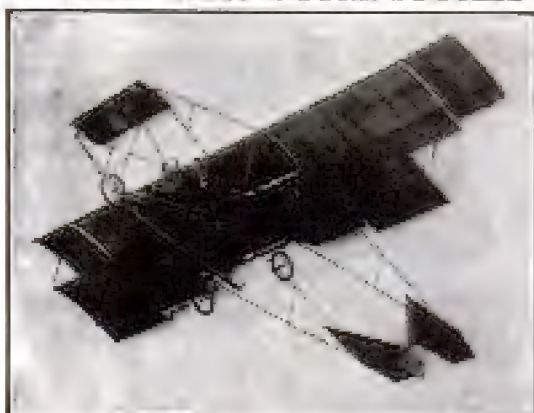
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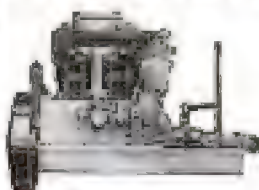
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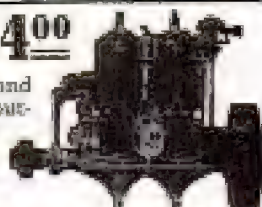
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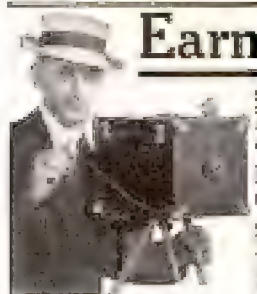
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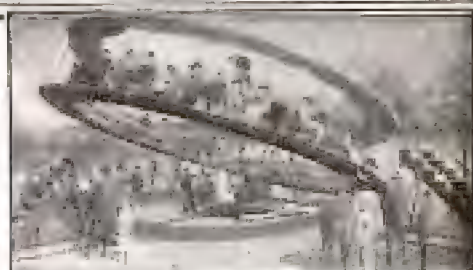
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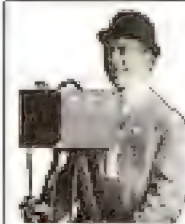
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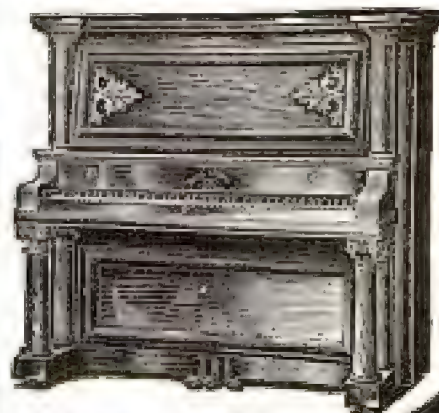
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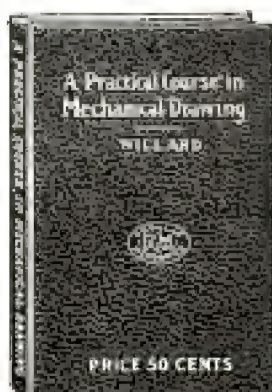
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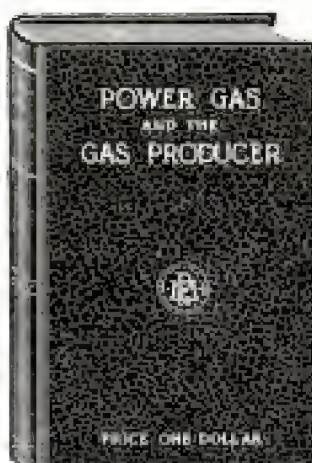
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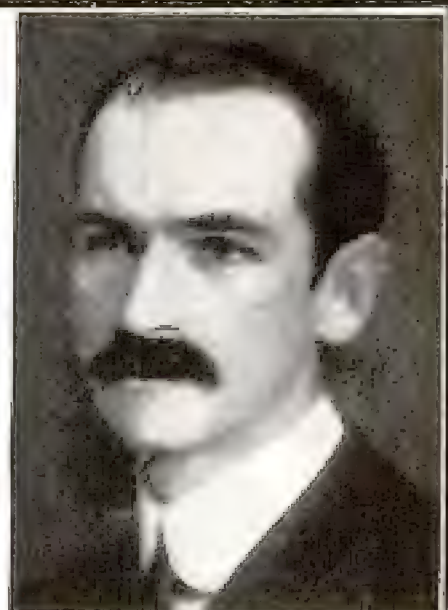
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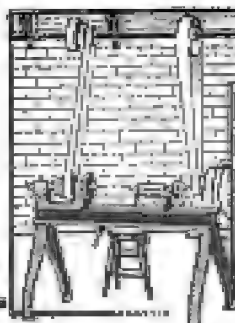
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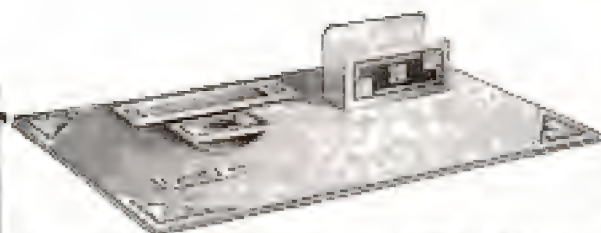
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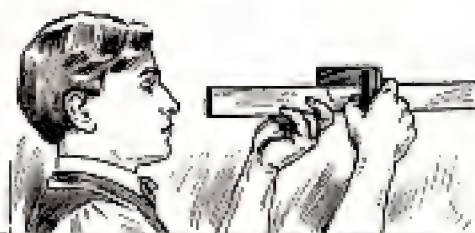
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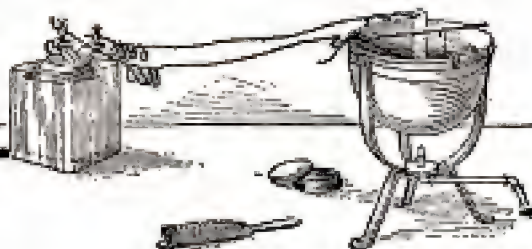
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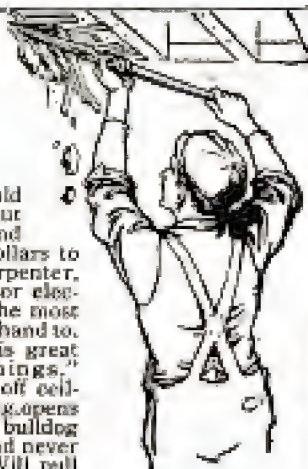
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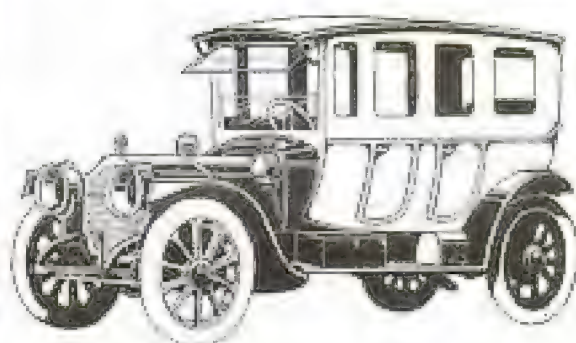
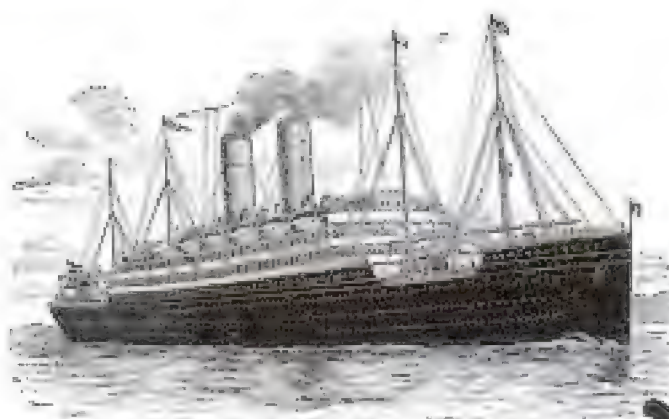
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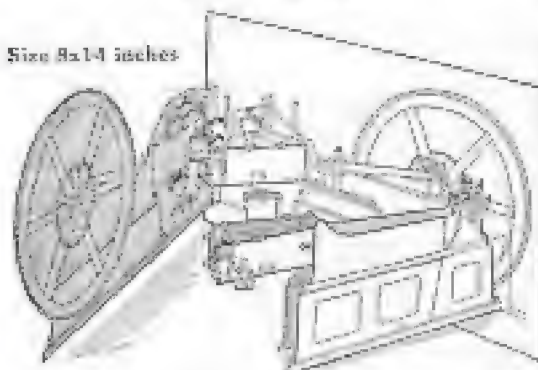


Illustration shows how parts separate

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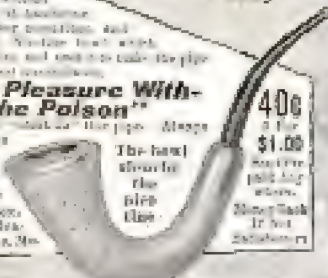
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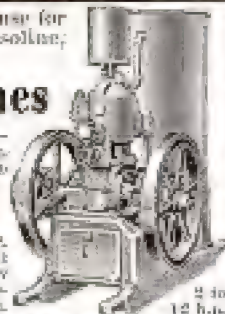
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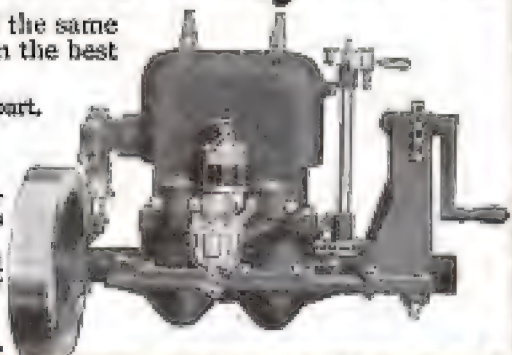
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Then let us send you copy of our new booklet PA-1—which tells all about the proper method of finishing floors and interior woodwork.

Johnson's Wood Dye

makes inexpensive soft woods just as artistic and beautiful as hard woods. Tell us the kind of woods you will use and we will mail you panels of those woods artistically finished—together with our 25 cent booklet—all free and postpaid.

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This Edison

Fireside Model
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The latest and greatest offer on the Genuine Edison. This offer is for every one who has not yet heard our Edison in his own home—for you to hear concerts and entertainments by the world-famous musicians—just such entertainments as the metropolitan theaters are producing.

MY OFFER

I will send you this Genuine Edison Fireside Model (newest model) complete with 1 dozen Edison Gold Moulded and Amberol Records, for an absolutely Free Loan. I don't ask any money down or in advance. There are no C. O. D. shipments; no leases or mortgages—absolutely nothing but a plain out-and-out offer to ship you this phonograph together with a dozen records of your own selection on a free trial so that you can hear it and play it in your own home.

Why I Want to Lend You This Phonograph

I know that there are thousands of people who have never heard the Genuine Edison Phonograph. Now, there's only one way to convince people that the Edison is superior, and that is to let them actually see and hear this remarkable instrument for themselves. That is why I am making this offer. The only way to make you actually hear these things for yourself is to loan you a Genuine Edison Phonograph free and let you try it.

All You Need Do

All I ask you to do is to invite as many as possible of your friends to hear this wonderful Fireside Edison. I feel absolutely certain that out of the number of your friends who will hear your machine there will be at least one and probably more who will want an Edison of his own. If there isn't find this sometimes happens? I won't blame you in the least. You won't be asked to act as our agent or even assist in the sale of a single instrument.

If You Want to Keep the Phonograph that is if you wish to make the phonograph your own, you may do so. Either remit us the price in full, or if you prefer, we will allow you to pay for it on the easiest kind of payments.

Our Easy Payment Plan Two dollars a month pays for an outfit. There is absolutely no lease or mortgage of any kind, no guarantee from a third party, no going before a notary, no publicity of any kind, and the payments are so very small, and our terms so liberal you never notice the payments.

FREE

Just sign this coupon now and mail it to us. I will send you our Edison Phonograph, complete, the very latest list of Edison Gold Moulded and Amberol Records (1500 of them) and our Free Trial Certificate entitling you to this grand offer. Sign this coupon or send postal or letter now. No obligations—get catalog.

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Moulded and Amberol Records and
Free Trial Certificate entitling me to your
grand offer, all free.

Name _____

Address _____

Please Mention Popular Mechanics

Don't Calculate—Let the Slide Rule Do It A Mistaken Idea

There seems to be a misunderstanding about what the slide rule will accomplish, many think it an instrument, the use of which is applicable only to Engineers and Technical men. So frequently have I heard this remark that I have decided to make an announcement here, that the slide rule is as valuable to any individual who has to do with figures as it is to the Technical man. I also want to help you in your work and, therefore, have caused to be inserted in my instruction book, simple directions whereby the Banker, Broker, Auditor, Buyer, Inventory Man, Cost Estimator, Printer, Contractor, Salesman, Timekeeper, Bookkeeper, Lumber Merchants, etc., can shorten their labor about 90% by the use of this valuable instrument. I have explained in simple words how to work out the following examples, some which, no doubt, come under your calling.

How much interest will be due on \$730.00 at 3% for 5 months?

If 620 articles cost \$6.30 what will 250 cost?

A bill of goods was bought for \$750.00 what price must they be sold at to make a profit of 25%?

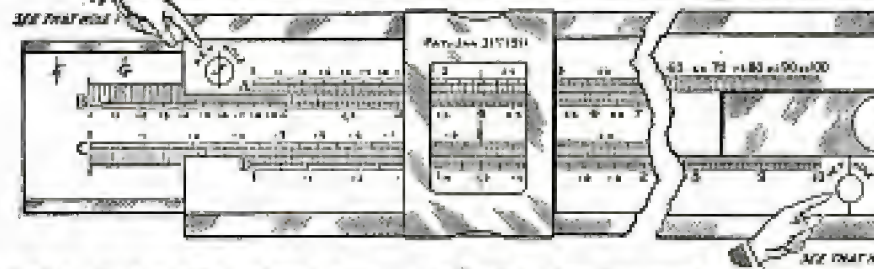
How many sheets of cardboard 24x30 will be required to make 850 cards 3x5?

Suppose a workman requires \$20.00 per week of 40 hours, but he only works 17 hours; how much is due him, also what is the rate per hour?

A bill of goods amounted to \$6.75; three discounts are given, viz.: 10%, 3%, 15% 1. What is the net amount?

It cost \$25.00 to sell a bill of goods amounting to \$245.00; what was the percentage of the cost of selling?

Some of the above examples must use up a great amount of your men's or your own time. By the aid of this slide rule the answer is given in most cases in a few seconds.



Engineers, Electricians, Draftsmen, Superintendents, Managers, Master Mechanics, Estimators and Business Men:

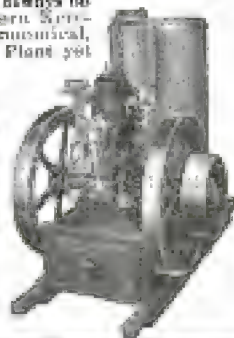
Your Time is too valuable to waste in solving problems or checking over the work of others the old way. The Richardson Slide Rule will do it mechanically. One of the most valuable instruments ever offered to mankind is the Slide Rule. Not until the above rule was designed did it become possible for a person of a limited education to learn to operate it.

Besides, the usual price has been reduced one-half, and the free instruction book is "written so you can understand it." This Slide Rule will multiply, divide, add, subtract, extract the square and cube roots, find the decimal equivalent of vulgar fractions or "vice versa," calculate interest, percentages. In addition to above the rule is direct reading for forty-four other problems, such as the Horse Power of Engines, Pumps, Boilers, Belts, Water Falls; area of motor to run a pump; size of duct for ventilating; percentage a recording wattmeter is "slow" or "fast"; radiation and absorption; and steam engine required; change gear and pulley problems; areas, circumferences and diameter of circles. You simply place the key to the problem in the key hole (the key is printed in red) and answer is given direct. This rule is not latest improved type now being placed upon the market for the first time. See second cut "curved slide found with aluminum. No other like it. Price \$2.00 with instruction book, block aluminum flat 6-inches with runner. Scales celluloid printed and polished in two colors and available. It will make up your pay roll accounts. Calculations discounts off list price. For a Holiday present it has no equal.

GEO. W. RICHARDSON, Mechanical and Electrical Engineer, Ex. Chief Electrician, U. S. Navy, 4218-24th Place, CHICAGO, ILL.

POWER AT LOW COST Kerosene as Fuel 15 Days FREE Trial

HERE is Power for you that can always be relied upon. The Colton Modern Kerosene Engine is the most economical, simplest and most reliable Power Plant yet invented. Its many new improved patented features are most valuable and are not found on any other engine. Power is constant, speed regulated without stopping engine—adjusts itself instantly to any overload—no cranking to start it. Every Colton is sold under a positive, unqualified guarantee to give satisfactory service or money refunded. Our company has been established 37 years. Get it on trial and compare on simple, correct construction, superior quality materials and high grade workmanship. You will get accurate with less attention and furnishes more power per dollar than any engine you ever saw. Send for Free Engine Book at once.



Arthur Colton Co., 182 Brush St., Detroit, Mich.

SLAIN BY A SNEER

They jeered the flyer, they biased and sneered;
The wind blew strong—'twas the wind he feared.

But sneers cut deep and his cheek grew pale;
He feared the taunt and he feared the gale.

But sneers cut deeper than swirls of air;
He clutched the lever and faced them there.

Helpless he fluttered above the throng,
Fighting the wind while the planes went wrong.

Helpless he fell as the great wings veered—
Dead in the midst of the mob that sneered.

—Cleveland Plain Dealer.

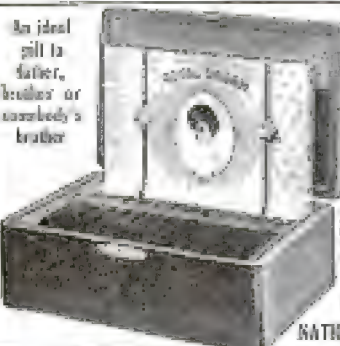
Do Your Own Soldering

No skill needed. Perfect work. Save the tinmith's charges by using the modern, combined solder and flux.

"TINOL" Just apply and heat. Use a candle, gas jet, or the Tinsel Alcohol Torch. No acid or resin. The Tinsel flux is non-corrosive and cannot damage the most delicate work.

If your hardware dealer does not handle Tinsel, send us his name and \$1.00 for Tinsel Torch and can of Tinsel Paste. Literature free.

HESS & SON, Dept. F, 1215 Filbert St., Philadelphia, Pa.



Do You Smoke?

NOTICE—A Box of Cigars at 50 Cents. Here is a gift, hand rubbed mahogany finished hamper FREE. Our way of introducing "Royal Dream" a new brand, equal to any 50 cent cigar. You are entitled to one box only—send two dollar bill or money order and we'll send to your address at once.

50 Cigars with Hamper for \$2.00

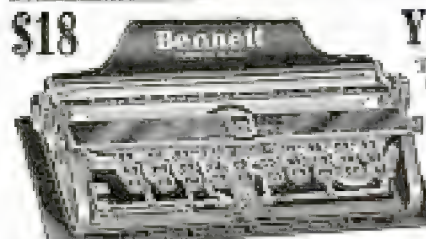
If you like a good smoke, get acquainted with Royal Dream—don't miss this special offer. Sold only in the U. S. In the future, ask for that your dealers. Place two dollars in an envelope, write name and address plainly, location Royal Dream and mail to:

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A short-cut to success in your. Every business and professional man or woman—every boy and girl—should know shorthand. We positively guarantee to teach you with perfect success, right in your own home by mail, in only 30 days. Thousands of successful students prove that we can do it. FREE BOOK—Shorthand in 30 Days—tells every detail of this wonderful new method. Tells how you can easily learn the system that is 50 years ahead of the rest, in just your spare time. Just a postal brings the facts. Address:

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There is \$100 worth of writing efficiency condensed in the BENNETT PORTABLE TYPEWRITER. It weighs but 4 1/2 lbs., its U. S. A. price is only \$18, yet it has standard keyboard of 84 characters, is strictly up-to-date and does perfect work. Can be carried with you for use at home, business or on the road. Built in famous Bennett Fisher Milling Machine Factory. Sold on liberal "money-back-guarantee." Get posted on this most needed typewriter. Over 25,000 in daily use. Write for catalog today. Fine opportunity for Agents. Foreign Address: 75 Cannon St., London, E.C.

P. N. BENNETT TYPEWRITER CO., 356 Broadway, NEW YORK



Anchoring Against Adversity

By
FRANKLIN O. KING

"Sweet are the Uses of Adversity," said Shakespeare, many Years ago. It may have been so in Shakespeare's time, but it is pretty Difficult to find any Sweetness in Adversity Today. It must be admitted, however, that Adversity does inculcate Thrift and Habits of Saving, and so we must agree with the Poet at least regarding one of Its uses.

How many Men of Your acquaintance are leading the Gay Life—Saving Nothing—Spending every Cent they make for Foolish Pleasures and Indulgences? "Everybody's Happy When the Sun Shines," and Life to such of These is a Rose-Strewn Pathway, with not a Care or a Sorrow in Sight. The world is their Oyster and They Reck not of the Morrow. Then comes the Chilling Wind of Adversity, and Hard Times are Staring Them in the Face. Help is being laid off at the Factory; the Office Force is Being cut down, and Salaries are being lowered to meet reduced Business. Or, Let Us suppose Sickness comes to the Head of the Household, and He who is usually so Vigorous and Jovial, is Pinned down for Weeks to a Bed of Pain, and his Family for the First Time Feel Keenly the Gaunt Fingers of Want clutching Them. These are instances of the Afflictions of Adversity, and the Moral that Adorns the Tale is:—*Get The Saving Habit, and Learn to Save For a Definite Purpose.*

The Best Way I know of to Anchor against the Storms of Financial Adversity, My Friend, is to Save for a Home which will produce an Income, and which will at the same time Afford a Safe and Pleasant Shelter for Your Family. For, after all, It is not until a Man Owns the Ground He Stands upon, looks from his Doorstone to the Shadowed Plumage of His Trees, and Plunges a Spade in the Ground, that He knows the True Meaning of a Home. The Best Place I know of to Get such a Home is in the Rain Belt of Gulf

* * *

Please send me your book "Independence With Ten Acres."

Coast Texas, where You can Grow Three Big Money-Making Crops a Year on the Same Soil, and without a Penny for Irrigation or Fertilization.

The U. S. Census of 1900 showed a City Population of 33½ Per Cent. The Census of 1910 showed a City Population of 46 Per Cent. At the Same Rate of Increase another Ten Years will Show the Majority of the American People in the Cities. Under such Circumstances, don't You Think it would be a Splendid Idea to Own a small Tract in Gulf Coast Texas, where You can Supply most of the Products the Big Cities Consume—and at very Profitable Prices? Come where Health, Prosperity and Happiness await You and where you can soon look the whole World in the Face and say: "I Owe no Man a Dollar."

Do You Know that Growers of Figs, Strawberries and Early Vegetables clear a Net Profit of \$300 to \$500 an Acre in Gulf Coast Texas? Do You Know men have realized

more than \$1,000 an acre Growing Oranges in Our Country? If You Do Not know these things, you should read up on the subject, and you must not fail to get our Book, which contains nearly 100 photographs of growing Crops, etc.

What would You think of a little Town of about 1,200 People situated near our Lands, where they ship on an average of \$400,000 worth of Fruit, Vegetables, Poultry, Eggs, etc., a year? During 1910 this Community shipped nearly \$100,000 worth of Strawberries alone.

We are situated within convenient shipping distance of Three Good Railroads, and in addition to this have the inestimable Advantages of Water Transportation through the Splendid Harbors of Galveston and Velasco, so

that our Freight Rates are Cut Practically in Half. The Climate is Extremely Healthful and Superior to that of California or Florida—Winter and Summer—owing to the Constant Gulf Breeze.

Our Contract Embodies Life and Accident Insurance, and should You die, or become totally disabled, Your Family, or anyone else You name, will get the Farm without the Payment of another Penny. If You should be Dissatisfied, we will Absolutely Refund Your Money, as per the Terms of our Guarantee.

Write for our Free Book. Fill Out the Blank Space in the First Column with Your Name and Address, plainly written, and mail it to the Texas-Gulf Realty Company, 1316 Peoples Gas Building, Chicago, Illinois. Read It carefully, and then use Your Own Good Judgment.



Two Texas Gulf Coast Products

NOTICE—The below reduced size page will be read with great interest:

FIELD FOR DRAFTSMEN

*This Page taken from *Popular Mech.* Advertising Section Jan. 1910*

Big Demand for Mechanical Draftsmen. Positions Paying \$100 to \$150 Per Month

It is perhaps not known to many Readers of Popular Mechanics, but especially to the ambitious, wide awake, and progressive ones and to the large number of Mechanics reading this paper that there is no better field or opportunity for advancement than there is to the practical and well trained Mechanical Draftsman.

But not that man is wanted who has the largest or most expensive library of technical school books "at home," neither the one that carries along with him under his arm when applying for a position a nicely engraved "beautiful Diploma" on paper (costing \$50 to \$75 per sq. ft.) nor the "would be" Draftsman that can "copy" a nice looking picture from another picture with given dimensions.

No, the demand is for Draftsmen with practical Drafting Room training that can "Do Things," Do it "themselves," and Do it right away "Right."

No Employer cares for your Diploma, neither for your set of nice "Books at Home" in your Book-case. He wants you to "Deliver the Goods" for the money he pays. To Draw \$100—\$150 per month, the average Salary paid to Draftsmen, you must be able to do more than "Only make a Copy" of someone else's drawing. Originality and practical ability is demanded of you and this requires practical training.

The quickest and best way to be trained on practical Drafting Room work and to get the required practical experience is to receive personal and individual Instruction from a High

Grade practical man at the trade, with a reputation as the most experienced man in training men to become **COMPETENT** and **SUCCESSFUL DRAFTSMEN**.

An ordinary Draftsman, not even the best Draftsman can teach this trade unless he has many years of experience as an Instructor, and has ability to impart knowledge that is understood and that will stick forever. A special gift that 99 out of 100 do not have.

Mr. P. Dobe, Chief Draftsman of the Engineers Equipment Co. (inc.) Chicago, with 20 years experience in training and handling men has for a good many years given personal individual Instruction by mail with the most deserving success, because his Instruction work consists of actual practical Drafting Room work that gives his personal student and apprentice the required practical experience.

He treats each student personally and gives him individual practical working instruction according to the ability of the student to master the work and to advance. His instruction is not given as patent medicine the same for all alike, and his personal assistance is very valuable to anyone.

Mr. Dobe has been an advertiser in this paper for a good many years and will send his "Successful Draftsmanship" Prospectus, 6x9, also list of 250 open Draftsmen positions and full information free. Anyone earnestly interested should write to him personally, his advertisements appear on the special colored inserted sheet in front of book.

Read my advertisements on colored insert front of book

Read my advertisements on colored insert front of book

→ Read it over again Every Word true ←

NOTICE—I accept for Instruction only a limited number of desirable and success-promising students, and not, like schools do, anybody and everybody that can pay the price.



30 Days Free Trial

No promises! No money needed! No red tape! You can try this all steel, shaft drive grinder with its Dimo-Grit (artificial diamond grit) wheels for **30 days absolutely free**—then if you do not want to keep it return it at my expense. You can **put all your tools in bright, keen condition**, and you will be amazed at the ease and speed you can do it—grind all your chisels, twist drills, gum your saws, etc., for 30 days free.

Dimo-Grit, "the wheel for steel"—25 times faster than the grindstone—10 times more efficient than emery—will not draw temper—no need of cooling with water

Dimo-Grit is the new artificial diamond abrasive, a twin product of Carborundum you have heard so much about, but Dimo-Grit is especially adapted to steel, leaving the keenest, smoothest edge.

Dimo-Grit cuts hardest steel as easily as emery does copper. The Dimo-Grit wheels of this grinder, turning **4000 revolutions per minute**, make the hardest job of grinding but a few minutes easy work. Prove it by trying the outfit on your own tools **30 days free**. Dimo-Grit crystals are really artificial diamonds as hard as real diamonds, fused in the marvelously hot electrical furnaces at Niagara-Falls, in which fire brick melts like bees-wax and is vaporized like water in a kettle. Genuine South African diamonds could cut steel no quicker than Dimo-Grit. Carborundum wheels furnished if wanted.



Complete Shop Outfit

The Hummer complete shop outfit embraces 14 attachments and accessories, supplying every sharpening, grinding and polishing need. Tool rests and attachments enable the apprentice boy to do difficult grinding such as twist drills, gumming saws, chisels, etc., fully as well as a high paid mechanic—saves tools—saves time—saves money—makes all work easier. Return the coupon for Free Trial Offer and free Book today.

Luther "Hummer" Tool Grinder

Mechanic's shop outfit includes 14 attachments—16 others to select from. No machine ever built is like the "Hummer," it makes tool-sharpening child's play. Shaft drive like an automobile, dust proof ball bearings—runs by foot power as easily as sewing machine—engine power can be applied. From the extra attachments such as jig saw, rip saw, lathe, drill, etc., you can select what you want. **No other machine so moderate in price saves money in so many different ways. 5 years guarantee.**

Return this coupon today for 30 Days FREE Trial

Send this coupon for 40 page free book and 30 days Free Trial Offer—then decide if you want to try our full shop grinding outfit 30 days free—you do not put yourself under any obligations by returning this coupon. Do it today.

Luther Grinder Mfg. Co.
309 Michigan St., Milwaukee, Wis.

Dimo-Grit Sharpening Stones. Ask your dealer for Dimo-Grit sharpening stones, fastest, smoothest cutting stones on the market. Look for the name "Dimo-Grit" on the stone.

Coupon

Luther Grinder Mfg. Co.

309 Michigan Street,
Milwaukee, Wis.

Please send without cost or obligation your 30 Day Free Trial Offer, and free Book telling the story of artificial diamond abrasive.

Name.....

Address.....



Startling Watch Offer



READ!

A Watch Offer Without Parallel

Write for our **FREE** book on watches; a book that posts you on watches and watch values—explains reasons for our most remarkable rock-bottom-price offer **DIRECT TO YOU** on the highest grade Burlington.

IF YOU WANT a highest grade watch (ladies' or gentlemen's), or if you ever expect to own such a watch, write **NOW** for the **FREE** Burlington book. See coupon below.

We won't "knuckle down" to selling systems among dealers, so we have decided to make such a tremendous and wonderful offer direct to the public on a first-class time piece, that no trust, no dealers under contract will or can stop us. You too will seize this opportunity to get the "Burlington Special" direct on this wonderful offer.

You should not buy a worthless watch just because it is cheap. No, need you pay trust prices now for a top-notch watch. The free Burlington book explains.

\$2.50 a Month at the **Rock Bottom Price**

\$2.50 a month for the world's most superb time piece? The easiest payments at the rock-bottom price—the **Rock-Bottom** price. To assure us that everybody will quickly accept this introductory direct offer, we allow cash or easy payments, just as you prefer.

No Money Down

absolutely nothing—you pay nothing—not one cent unless you want the great offer after seeing and thoroughly inspecting the watch.

We ship the watch on approval, prepaid (your choice of ladies' or gentleman's open face or hunting case). You risk

Now Write for the free book. It will tell you what you ought to know before you even examine a watch. It will tell you the inside facts about watch prices, and will explain the many superior points of the Burlington over the double priced products. Just send your name and address today.

BURLINGTON WATCH CO.

Dept. 1191, 19th and Marshall Blvd.

CHICAGO, ILLINOIS

Please send me (without obligations and prepaid) your free book on watches and copy of your \$1,000 challenge, with full explanations of your cash or \$2.50 a month offer on the Burlington Watch.

No Letter is Necessary. **COUPON** Will Do

Get the Free Burlington Book

THIS BOOKLET will quickly convince you too that you **DO** want an independent watch—made in the independent factory that is fighting the trust as best it can by giving better quality and superior workmanship throughout; we will quickly convince you that the Burlington watch, on which there is only **one** rock-bottom price (the same rock-bottom price everywhere), is **THE** watch for the discriminating buyer; that it is **THE** watch for the man or woman who wants, not the largest selling brand which everybody has, but the **best** watch, the watch bought by experts. **THE** watch that is absolutely perfect in its many points of superiority—the **Burlington Watch**. You will be posted on inside facts and prices when you send for the Burlington Company's free book on watches.

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